THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Search for weak spots in the market is not well rewarded. Producers are constantly surprised at the sustained momentum under which the trade is passing through December, when ordinarily signs of slackening multiply. In some quarters, particularly in certain forms of finished steel, the past week has been well up to the best of the year. In pig iron, while as much cannot be said there is continued contracting and the higher prices of the past few weeks are being generally paid on deliveries running to the middle of 1902 There has been an impression abroad in the trade for months that with the very considerable additions to the country's blast furnace capacity under way in the past year, the tendency of the pig iron market would be down, rather than up. But these new furnaces have been almost wholly an addition to the capacity for steel making pig. And not only have furnaces heretofore producing Bessemer iron not been turned into the foundry iron trade, as was predicted in some quarters, but instances are known in which in the near future the movement will be in the other direction. The production of foundry iron has not been equal to the demand and there is no immediate indication that the equilibrium will be restored, putting aside any probability of the excess being thrown onto the other side. The consumption of finished steel has taxed the converting and melting capacity of the country to its utmost, and among the plans of the United States Steel Corporation that will have early attention is that of providing additional open-hearth steel. At least one addition is to be made also to its blast furnace outfit Making all allowances for new plant—and there is a relatively small amount of converting or open-hearth capacity likely to be added in 1902 from so-called independent sources—the problem of an outlet for their steel is not likely to trouble our manufacturers in 1902 at least. Existing finishing plants and those building, which buy steel in the open market, may have to depend upon imports to a greater extent in the early months of the new year than is now commonly believed. The importations of billets and sheet and tinplate bars from Germany thus far amount to several thousand tons, the greater portion for the East, but a part has been taken by Central Western plants, including a new tinplate works at Canton, O. The past week has shown additional firmness in foundry iron, comparatively little of which can be had for delivery in the first quarter of next year. Bessemer iron is pegged at $15.25 Valley furnace, and the United States States Steel Corporation has taken all the iron offered by the merchant furnacemen of the Valleys for delivery in January, amounting to less than 25,000 tons. It is understood that these furnaces will not have any considerably greater amount to offer for February. In basic iron the largest transaction is a long time contract made by an independent steel company for the output of a Shenango Valley furnace. This is in line with some other recent developments which limit the number of Valley furnaces making iron for the open market. The situation in finished material argues for a strong, well maintained market for much of the coming year at least. The plate mills are getting somewhat more business and the agreement was reaffirmed at the New York meeting. The report that the consolidation of Eastern plate mills that lacked only minor details of being made, is now entirely off, is confirmed. The hitch was over an agreement not to re-engage in plate manufacture. In the structural steel pool the conservative element prevailed and present prices were reaffirmed. It was argued that this course would stimulate business for the coming season, while an advance might retard building operations. The situation in bars is strong so far as present operations are concerned, the mills being still behind on deliveries, but this line is not counted on to show the stability so strongly in evidence in some others. The placing of five more vessels with lake ship-yards means an additional 7,000 to 8,000 tons of plates and shapes, and brings up to $10,000,000 the business on the American Shipbuilding Co.'s books for next year.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Dec. 11.

During the past week the manufacturers' agreements on both structural material and plates were renewed for another year. All the concerns parties to these agreements during the past year continue in the same, despite reports to the effect that several have dropped out. No changes in prices were made either in structural steel or plates, although considerable pressure was brought to bear to bring about an advance in structural material owing to the great demand at present, and the large tonnage booked for delivery the first half of next year. After mature deliberation it was decided that a continuance of the present prices would tend to stimulate the market next spring, while an advance might retard the building movement which promises to be greater next year in all the populous centers of the country than ever before. The meeting of the plate manufacturers was held in New York last Thursday, while the structural manufacturers met on Friday. It was also announced at the plate meeting that the proposed combination of the four Eastern plate mills had fallen through, after the deal had been almost consummated.

Pig iron is still the absorbing feature of the market and prices continue to advance. Small sales of Bessemer iron for delivery the remainder of this month have been made at $16 per ton at the furnace, or $16.75, Pittsburg. The United States Steel Corporation covered part of its requirements for January delivery during the past week at $15.25 at the furnace and an additional tonnage will be purchased this week. It has been definitely decided by the officials of the corporation to purchase iron in the open market from month to month only, despite the request of Valley furnacemen to cover requirements for a period of three months. Monthly purchases have been the practice since the United States Steel Corporation was formed and it will be continued owing to the fact that it is next to impossible to estimate requirements three months in advance. A number of Southern furnaces have again advanced prices of forge and foundry irons 25 cents per ton, placing the former on a basis of $14.90, Pittsburg, and the latter at $15.90 per ton the same delivery. It is also stated that few of the Southern furnaces can make deliveries on new business before March of next year.

While all the furnaces in the Valleys and in the Pittsburg district are hampered more or less on account of the shortage of coke, at this writing not more than a half dozen furnaces in these districts are banked. All the furnaces are behind on their shipments of iron to consumers and it is estimated that even with improved conditions the Valley furnaces will owe the United States Steel Corporation 25,000 tons of Bessemer iron by the first of the year. For this reason the requirements of the United States Steel Corporation for January will not be as large as they would have been if deliveries of iron in the past two months had been unhampered.

Fancy prices are being offered for coke for prompt shipment and a number of producers have standing orders for large tonnages, subject to immediate cancellation, at prices ranging from $2.50 to $2.75 per ton for furnace coke. Practically all the big contracts for furnace coke for delivery the first half of next year are closed, and prices have been advanced to $2.15 for Connellsville furnace coke and $1.90 for outside coke.

The importation of German billets continues and it is estimated that fully 5,000 tons have been brought in up to date. The greater portion of this tonnage has been taken by Eastern mills although fully 1,000 tons have been shipped to points west of Pittsburg.

PIG IRON.—Sales of foundry iron for delivery the first half of next year are not large, partly for the reason that the majority of the large consumers have already placed their contracts while the remainder are holding off until the first of the year. It is doubtful if the weakening of prices which some expect will be seen, owing to the fact that the furnaces have a sufficient tonnage booked to insure the holding the present basis of prices. Sales of No. 2 foundry have been made in the week in small lots at $16 per ton for prompt delivery and for future shipment furnaces are asking $15.75 per ton. We also note the sale of 3,500 tons of gray forge at $15 per ton Pittsburg. During the week the United States Steel Corporation purchased part of its requirements of Bessemer for delivery during the month of January and it is expected additional purchases will be made this week. Little Southern iron is now being sold in this market for the reason that Northern iron can be had at practically the same prices and furthermore the Southern furnaces are not urging their iron in this market at the present time. One prominent local concern is at present disposing of about 15,000 tons of Bessemer iron monthly as its iron producing capacity is larger than its steel output. This state of affairs will be changed, however, when the new Talbot furnace is placed in operation when the company will be compelled to purchase iron in the open market again. We revise our quotations as follows:

Bessemer, Valley	$15 25 to 16 90
Bessemer, Pittsburg	16 00 to 16 75
No. 1 Foundry	16 00 to 16 50
No. 2 Foundry	15 75 to 16 00
No. 3 Foundry	15 00 to 15 50
Gray Forge, Pittsburg	14 75 to 15 00
Chilled Basic, Valley	15 00 to 15 25
Chilled Basic, Pittsburg	15 75 to 16 00

STEEL.—Importations of German billets and sheet bars up to date amount to about 5,000 tons. The Eastern mills have been the largest importers as they have the advantage in freight rates east of Pittsburg. Small lots of prompt Bessemer billets have been sold during the week at $28 per ton, while it is next to impossible to secure open-hearth billets for delivery short of the first of the year. It is also difficult to secure any round tonnage of billets for delivery the first half of next year. The United States Steel Corporation cannot provide for independent mills owing to the big consumption of its own finishing mills and the billet situation is growing graver every day. Shortly after the first of the year the Union Steel Co. will place in operation its second rod mill, which will make the company's daily output of rods about 1,000 tons. This will have to be marketed and will doubtless have its effect on the rod market. At present manufacturers are asking $33 per ton for round lots for future delivery, although it is stated that any considerable amount can be bought at $32.50 per ton.

FERRO-MANGANESE.—The largest producer has reduced the price of ferro $1 per ton. This is mainly due to the big importation of the German product which is being marketed at $50 per ton. Domestic ferro, 80 per cent is quoted at $52.50 per ton, delivered at buyer's mill.

SPELTER.—The spelter market continues to gain strength daily and prices have advanced to 4.25c to 4.30c, for prime Western grades delivered, Pittsburg.

MUCK BAR.—The demand for muck iron for delivery the first half of next year continues good and we note the sale of 3,009 tons at $29.50 per ton.

SKELP.—Independent manufacturers of merchant pipe are covering their requirements of skelp for the first half of next year and the market is somewhat stronger in consequence. We note the sale of 5,000 tons of iron skelp at 1.80c. Grooved and sheared skelp is held at 1.70c to 1.75c.

RAILS AND TRACK MATERIAL.—The buying of rails continues and it is probable that by the end of the month the rail mills of this country will carry on their books fully 2,000,000 tons for delivery next year. Our quotations are as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $42; 12 pounds, $38; 16 pounds, $35; 20 pounds, $34; 25 to 40 pounds $32. Track material: Spikes, 1.95c to 2c; track bolts, square heads, 2.40c; hexagon heads, 2.55c; fish plates, 1.50c to 1.60c.

PLATES.—At a meeting of the plate manufacturers held in New York last Thursday it was decided to continue the plate agreement for another year. Despite contrary reports none of the firms dropped out of the agreement. It was definitely announced, however, that the proposed plate combination of Eastern plate producers had fallen through. While it was conceded that the demand for plates was not large, it was stated that for this season of the year a satisfactory tonnage is being closed daily. Prices were reaffirmed as follows: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox. A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c; and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $1 extra; gauges Nos. 7 and 8, $3 extra; No. 9, $5 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

BARS.—The amount of new business in both iron and steel bars is not as large as the manufacturers would like to have it. While the mills are all in full operation on old contracts, the amount of new business placed thus far this month is not equal to the shipments. We make the following quotations: Common iron bars, 1.50c, Pittsburg, for Western delivery and 1.55c, Pittsburg, for Eastern delivery; refined iron bars, 1.75c and upwards; Bessemer steel bars, 1.50c; open-hearth, 1.60c; plow beams and cultivator beams, 1.50c, net; channels, angles, zees and tees, Bessemer under three inches, 1.60c; over 3 inches, 1.70c. Hoops and bands are quoted at 1.90c, full extras.

PIPES AND TUBES.—Demand for merchant pipe for this season of the year continues good and the outlook for next year is bright. Some of the independent producers are making concessions to secure business, a move not considered wise by some of the manufacturers when the consumers are not in the mood to buy. The demand for seamless tubing is good and the mills of the Shelby Seamless Tube Co. have contracts on their books for fully three months' business. Discounts to consumers in carload lots, Pittsburg, are as follows:

MERCHANT PIPE.

	Blk. Per cent.	Galvd. Per cent.
⅛ to ⅜ and 11 to 12 inches	61	48
½ to 10 inches	68½	56

BOILER TUBES.

Steel.

	Per cent.
1 to 1¾ inches	47½
2¼ to 5 inches	65½
1¾ to 2¼ and 6 to 13 inches	60

Iron.

	Per cent.
1 to 1¾ and 2¼ inches	43½
1¾ to 2¼ inches	43
2¾ to 13 inches	53

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12¾ inches	65

SHEETS.—Deliveries on the heavier gauges are from two to three months behind and neither the consolidation nor independent manufacturers are in a position to make better deliveries. On the lighter gauges the independent manufacturers are making slight concessions to secure business. On black sheets in large lots we make the following quotations to consumers: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets are quoted at 70 and 5 off in carload lots, while less than carload lots are held at 70 off.

STRUCTURAL MATERIAL.—At a meeting of the manufacturers of structural material held in New York last Thursday the price agreement was continued for another year. No advance in prices was made although one was expected by the trade. Several manufacturers desired an advance, but it was deemed the wisest policy to continue former quotations, as it was believed that by doing so the building boom of next year will be greatly stimulated. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—During the week contracts for wire nails were reported as having been closed at $2 per keg. Independent manufacturers report that they are pretty well filled up for the first half of next year and the low prices have stimulated buying considerably. We revise quotations as follows: Single carloads of wire nails to jobbers at $2 to $2.10 and less than carloads at $2.15 to $2.20; plain wire, carload lots, is quoted at $2.15 to $2.20 to jobbers and $2.25 to $2.30 to retailers; painted barb wire, $2.60 in carload lots to jobbers, and $2.70 to retailers; galvanized barb wire, $2.85 to $2.90 in carload lots to jobbers, and $3 to retailers. Cut nails are quoted at $2.05, Pittsburg, in carload lots, and $2.10 to $2.15 in less than carload lots, 2 per cent off in 10 days.

MERCHANT STEEL.—Demand for merchant steel continues fair. All the mills report that the outlook for next year is very bright and from two to three months business is carried on the books of all. We make the following quotations: Turned, cold rolled and ground shafting 60 and 62½ per cent off for car lots and 55 to 57½ per cent off for less than car lots; tire steel in carload lots and over, 1.60c; less than carload lots, 1.75c to 1.80c. Toe calk is sold at 1.70c, in large lots, and in small lots as high as 1.85c. Tool steel is held at 7c and upwards, according to quality.

OLD MATERIAL.—Heavy melting stock for open-hearth plants is in big demand at the present time and prices have advanced slightly for desirable material. We revise quotations, gross tons, as follows: Heavy melting stock, $16.75 to $17.25; low phosphorus melting stock, $18 to $18.50; steel rails, $17 to $17.25; busheling scrap, $13 to $14; No. 1 wrought, $17 to $17.25; iron rails, $21 to $22; cast borings $8.25 to $8.50; cast scrap, $14 to $14.25.

COKE.—For the week ending Saturday, Nov. 30, the estimated production of the Connellsville region was 237,527 tons, an increase over the production of the previous week of about 1,000 tons. One of the largest producers of coke in this region has 100,000 tons of coke stocked owing to the shortage of cars to move the material. Coke for prompt shipment is commanding premiums amounting to 50 and 60 cents per ton. We quote Connellsville furnace coke for delivery the first half of next year at $2.10 to $2.15 per ton and foundry at $2.50. Outside furnace coke is held at $1.90, while foundry is held at $2.15 to $2.25.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
534 MONADNOCK BLOCK, Dec. 10

Though hitherto mills and jobbers have invariably noticed a falling-off in business at this time of the year, there has been no reduction apparent with the approach of the present holiday season. Consumers keep sending in specifications on old contracts, and new business is being offered freely. This may be accounted for, in part, by the greatly increased manufacturing operations in this territory and to the mild weather which has prevailed thus far in this section. Were it not for the scarcity of cars and the consequent curtailment in both production and consumption, a better condition of trade could not be desired. The car embargo has been most pronounced now for two months, and is most seriously felt by the blast furnaces in this territory, whose receipts of coke have fallen to practically nothing, though finished products have suffered in proportion. The Illinois Steel Co. has five furnaces out of blast, one at Milwaukee, one at Bridgeport, and three at South Chicago, all for want of fuel. Two of the latter are new furnaces, and the third is stack No. 10, which has been overhauled and remodeled. The Iroquois Iron Co.'s new stack at South Chicago has been waiting since October for coke, and it is reported that two Virginia furnaces went out of blast last week for the same reason. The furnace at Mayville, Wis., was idle for a month, but has since gone in blast, though its supply of fuel is very precarious. Some furnaces that are fortunate enough to have plenty of fuel report that they are accumulating stocks of pig iron because they cannot get cars enough to ship it out. Manufacturers and shippers are now looking for the close of lake navigation for relief, though whether this will divert the number of cars needed in this territory, in view of the increased volume of trade and delay in shipments is extremely doubtful.

PIG IRON.—Transactions during the past week have been confined mostly to small lots, though the aggregate tonnage is very large. Some good sized inquiries have come to the front, varying from 5,000 tons to 1,000 tons. All furnaces in this territory report that they are sold up for the first six months of next year, and are now booking contracts for delivery in the fall of 1902. There is little Northern iron to be had in Chicago except for late delivery, and prices are very firm. The demand for iron for prompt delivery far exceeds the ability of furnaces to supply it, and premiums are offered to gain the desired shipment. The scarcity of cars is still most pronounced, and in addition to the five local furnaces out of blast for want of fuel, it is reported that two furnaces in Virginia represented here had to blow out last week for the same reason. Furnaces that have kept in blast are finding great difficulty in moving their stocks of pig iron for want of cars, though the demand from consumers grows more insistent daily. We quote prices as follows:

Lake Sup. Charcoal	$18 00 to $18 50	Southern Coke No. 4	$14 15 to $14 40
Local Coke Fdy. No. 1	16 00	Southern No. 1 Soft	15 65 to 15 90
Local Coke Fdy. No. 2	15 50	Southern No. 2 Soft	15 15 to 15 40
Local Coke Fdy. No. 3	15 00	Southern Gray Forge	14 15 to 14 40
Local Scotch Fdy. No. 1	16 00	Southern Silveries	15 90 to 16 40
Local Scotch Fdy No. 2	15 50	Jackson Co. Silveries	17 00 to 17 50
Local Scotch Fdy. No. 3	14 50 to 15 00	Ohio Strong Softeners	17 00 to 17 50
Southern Coke No. 1	15 90 to 16 15	Alabama Car Wheel	20 50 to 21 00
Southern Coke No. 2	15 15 to 15 40	Malleable Bessemer	16 50 to 17 00
Southern Coke No. 3	14 65 to 14 90	Coke Bessemer	18 00 to 18 50

BARS.—Railroads and affiliated interests have been heavy buyers during the past week, and the business from the general trade has been exceptionally good. Consumers are specifying freely on contracts, and mills are in a satisfactory condition. We quote iron and steel bars, 1.65c, Chicago; out of store, 1.90c to 2c.

SHEETS.—New business is plentiful, though mills seem to make no progress in catching up on delayed deliveries. Jobbers report as a result that the demand from warehouse stocks is larger than usual for this time of the year. This is the month when many concerns take inventory of stock, but consumers as a rule are accepting material as rapidly as it can be delivered from mills, the unsatisfactory condition of transportation facilities being largely responsible. We quote No. 27 black, out of store, 3.50c to 3.65c, and galvanized 65 per cent to 70 and 2½ per cent.

BILLETS.—No large sales are reported, though a few orders have been filled for 100 tons and less. Prices are firm at $31 to $33 for Bessemer billets, and $33 to $35 for open-hearth.

STRUCTURAL STEEL.—As a result of the mild weather with which this section of the country has been favored, consumers have been specifying very heavily on old contracts. All mills report an excellent demand for material, and new business is plentiful. The Scully Steel & Iron Co. has let contracts for an addition which will require between 300 and 400 tons of structural shapes. Mills are still some months behind in deliveries. We quote mill shipments, carload lots as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; angles, 6x6 and under, 1.75c, over 6x6, 1.85c; plates, 1.75c base; tees, 1.80c; zees, 1.75c; small lots from

store, ½c to ¾c higher; beams and channels from store, ½c to ¾c per pound higher.

RAILS AND TRACK SUPPLIES.—There are numerous good-sized inquiries for steel rails for spring delivery, in many cases from interurban railroads, but as the capacity of mills is taken for practically the entire ear and early delivery cannot be secured, the aggregate tonnage booked is greatly reduced. Demand for track supplies and light rails keeps up to former proportions, though it is difficult to get delivery of the former within three months. We quote as follows: Standard rails, $28; light sections, $34 to $36, according to size; out of store, $40 to $44; splice bars, 1.70c to 1.80c; spikes, 1.95c to 2.05c; track bolts and hexagon nuts, 2.80c to 2.90c, out of store, 2.90c to 3c; square nuts, base, 2.65c to 2.75c; out of store, 2.75c to 2.85c.

MERCHANT STEEL.—Specifications on contracts already are reported as very heavy by manufacturers. New business is only fair. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.90c to 2c; open-hearth spring steel, 2.25c to 2.50c; toe calk, 2.40c to 2.60c; sleigh shoe, 1.85c to 1.90c; cutter shoes, 2.40c to 2.60c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 50 per cent.

PLATES.—New business has been somewhat better than for several weeks past, though the orders are all of moderate size. The local mill was started up last week. Our quotations follow: Tank steel, base, ¼ inch, 1.75c; flange steel, 1.90c to 2c; marine steel, 1.95c; firebox steel, ordinary, 2c to 2.10c; special, 2.25c and upwards. Jobbers are selling from store, according to size, as follows: Tank steel, 1.90c to 2c; flange steel, 2c to 2.25c; marine steel, 1.95c to 2.10c; firebox steel, ordinary, 2c to 2.25c; special, 2.50c and upwards.

CAST IRON PIPE.—There is no change from the report of last week. This is not the season for buying pipe, and demand comes almost entirely from jobbers' stocks. We quote as follows: 4-inch water pipe, $29; carload lots, f. o. b. Chicago; 6-inch water pipe, $28; 8-inch and larger sizes, $27; gas pipe, $1 per ton higher than above prices.

MERCHANT PIPE AND BOILER TUBES.—Buying has been light during the week. The scarcity of cars is affecting shipment of material on old contracts from Eastern points. No change in prices. Our quotations follow:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ and 11 to 12 in	59.5	46.5
½ to 10 inches	67	54.5

BOILER TUBES.

	Steel Per cent.	Iron Per Cent.
1 to 1¼ in	40	35
1¼ to 2½ in	45	40
2¾ to 5 in	55	50
6 in. and larger	45	40

WIRE AND WIRE NAILS.—The price of nails has been shaded in special instances during the past few weeks, but this has not been very extensive in this territory. Taking the situation as a whole the market is firm, and there is every indication that the movement during the current month will be exceedingly large. This is particularly due to the fact that freight rates will be readjusted on January 1. Orders from the jobbing trade continue freely, and there is ample evidence that neither jobbers nor retail dealers are carrying any stocks of consequence on hand at the present time. The heavy volume of trade is attributed to the open weather which has prevailed throughout the west and southwest, and not to any anticipation that buyers may have of an impending advance. Prices from Chicago to the retail trade are on the basis of $2.30 for nails in small lots; for barb wire, $2.80; painted barb wire, $2.70 to $2.80; and galvanized wire, $3 to $3.10.

COKE.—There is no change to report from the condition that has prevailed for several weeks. Not a third of the required amount of coke is being received, consequently sellers are absolutely unable to fill contracts. We quote Connellsville coke, $5 to $5.25; though higher prices are secured for prompt delivery.

OLD MATERIAL.—Very little buying has been done during the past week, and it is difficult to learn what is the correct price for various grades of scrap iron. Most of the mills in this territory have a sufficient stock on hand to tide them over the holidays, and sellers do not anticipate much buying for the rest of the year. We revise our quotations as follows:

Old iron rails	$21 00 to $21 50	Relaying rails	26 00 to 27 00
Old steel rails, 5 ft. and up	19 00 to 19 50	Old Wheels	$16 00 to $16 50
Old steel rails, mixed	13 50 to 14 50	Heavy melting steel	13 50 to 14 25
		Mixed country steel	10 50 to 11 00

The following are net selling prices per ton:

No. 1 R. R. wrought	$15 00 to $15 50	Iron axles	$20 00 to $21 50
No. 2 R. R. wrought	13 25 to 13 75	Cast borings	4 50 to 5 25
Dealers' forge	13 00 to 13 50	Wrought turnings	11 00 to 11 50
No. 1 bushelling	11 00 to 11 50	Iron axle turnings	12 00 to 12 50
No. 1 R.R.& mach. cst.	11 50 to 12 25	Steel axle turnings	10 50 to 11 50
Railway malleable	12 00 to 12 50	Stove plates	8 50 to 9 00
Country malleable	11 50 to 12 00	Old iron splice bars	16 50 to 17 00

CLEVELAND

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 11.

Water shipments of ore from the Lake Superior region passed on Dec. 1 the 20,000,000 ton mark that has long been a prediction for this year. The November shipments were 1,865,353 gross tons, making the total to Dec. 1, 20,000,926 tons, as against 18,570,310 tons by water in the entire season of 1900. The figures above do not include the 230,000 tons from the Michipicoten range, of which about 160,000 tons came to Lake Erie ports. It is easy to see that 20,500,000 tons will be considerably exceeded, when the all-rail shipments are added, since it is estimated the water shipments for December will be close to 250,000 tons. While strictly speaking the Michipicoten shipments are foreign ore, they are a part of the reckoning, particularly the portion that enters into the mixtures of Central Western furnaces.

PIG IRON.—At $15 for No. 2 foundry and $15.50 for No. 1 foundry at Valley furnace, business is being done for the first quarter and the first half of 1902. The Northern furnaces cannot make deliveries this year on new business, but some Southern iron is offered for early delivery on the basis of the last advance. Southern iron as a rule is no higher than in late November, though on deliveries in the early part of the year some sellers are asking an advance of 25 cents. One selling concern has been scouring the South recently to pick up 3,000 tons for first quarter delivery. For Bessemer iron the price is unchanged at $15.25 for January delivery though as high as $16 has been paid on small lots for prompt shipment. The United States Steel Corporation has made purchases for January, having taken, it is understood, all the iron the Bessemer furnaces had to offer. The price was $15.25. Charcoal iron is very strong as are also Southern Ohio softeners. A long time contract between a Valley furnace company and a Shenango Valley steel company has been made, calling for the output of a furnace running on chilled basic. Makers are asking $15 to $15.25 for basic cast in chills. We quote the market as follows:

Bessemer	$16 00 to $16 25	Scotch No. 1	$16 00 to $16 25
No. 1 Strong F'dry	16 00 to 16 25	Scotch No. 2	15 50 to 15 75
No. 2 Strong F'dry	15 50 to 15 75	Gray forge, Valley	14 00 to 14 25
No. 3 Foundry	15 00 to 15 25	Lake Superior charc'l	18 00 to 18 50

FINISHED MATERIAL.—New vessel orders seem to be inexhaustible. Though the American Shipbuilding Co. is booked up to August, 1902, five additional vessels have been figured on the past week and are believed to have been contracted for, deliveries to be made in August and September of next year. These would bring the total business on the books of lake shipyards for 1902 up to fully $10,000,000. The plates and shapes for these last five vessels amount to 7,000 to 8,000 tons and this order when placed will add further to the improvement in the plate trade, that has been steady in the past month. The plate mills have reaffirmed prices on a 1.60c basis Pittsburg for tank, and the Waldorf-Astoria meeting last week put the market on a basis that is expected to be maintained despite the fact that the plate consolidation has fallen through. Consumers of structural steel have been buying for the past two or three weeks, contracts running to June and July of next year. The point seems to be that contracts may well be made now to insure delivery when the active season is on. Deliveries seem to be improving in light sheets, but are little if any better on the medium gauges, particularly Nos. 14, 16 and 18. In some cases May deliveries are just being made in these sheets. It is understood producing capacity is to be increased. There is somewhat more compe-

tition in evidence in sheets, particularly on galvanized. We quote prices as follows on carload lots to consumers. On less than carload lots $2 a ton more is asked. Jobbers get a concession from the prices below in lots of 500 bundles and over: Nos. 14 to 16, blue annealed, 2.50c to 2.60c; No. 20, one pass through cold rolls, 2.70c to 2.75c; No. 24, 2.90c to 3c; No. 27, 3.05c to 3.10c; No. 28, 3.15c to 3.20c. The wrought pipe trade is naturally quiet and there are some slight variations in quotations, competition being enough to turn business on the offer of an extra 2 per cent. The bar mills seem not to be catching up on deliveries very fast, though capacity has increased and there are more interests to keep in line on a price agreement. Makers intimate that any expectation of an early reduction in price will be disappointed judging from the persistence of demand.

OLD MATERIAL.—The market is quiet but prices are held up to previous quotations in most cases. In car wheels and steel rails, short lengths, our previous figures are slightly reduced. We note the sale of one lot of 100 net tons of machinery scrap in the week at $12.75. Prices, all in gross tons, are as follows:

Old steel rails, rolling mill lengths	$17 00 to 18 00
Old steel rails, short lengths	15 75 to 16 50
Iron rails	21 00 to 22 00
No. 1. railroad wrought	16 50 to 17 50
Mill scrap	14 50 to 15 00
No. 1. machine scrap	13 75 to 14 00
Cast borings	6 50 to 7 00
Grate bars	9 00
Sheet iron	9 00 to 10 00
Stove plate	10 00 to 10 50
Car wheels	15 50

CINCINNATI.

Dec. 10.

Whatever change there has been in all lines in the iron trade has been toward greater strength. Pig iron grades that have been taken up and altogether there is a firmer feeling than not followed the movement of some of the leaders have fallen fallen into line, and such as have been neglected by buyers have there has been, and that is saying a good deal. Manufacturers have been buying liberally of finished material, the jobbers are crowding the mills for delivery. In this respect there is not very much relief, as far as all plates and sheets and structural material are concerned, and but little encouragement in iron and steel bars.

Machine shops are full of business and manufacturers in various lines—shafting, car wheels, and the like—are behind their orders to such an extent that work needed immediately cannot be delivered under two and three months. Indeed, the business of car wheel manufacturers is such that they have made an impression on the market for car wheel iron, which has advanced 50 cents a ton, being the only Southern grade of pig iron that shows any change this week over last.

PIG IRON.—The strength of the market for pig iron was shown in the advance during the week of 50 cents a ton in Northern foundry grades and one Southern grade. Malleable coke is also up about the same amount. It seems that the demand for iron is unlimited. Weeks ago it was thought that the melters had bought pretty well up for the first half of the year, but the buying has continued at about the same volume as heretofore. Not only has the buying been for the first half of the year, but there has been more than one instance in which considerable amounts for immediate delivery or before the end of the month have been wanted and wanted badly. It has not been an easy matter to fill such orders as these last mentioned, but by dividing the business up and scouring around among the furnaces the amounts have been secured. Attempts on the part of the consumers to get furnaces to anticipate contracts have proved entirely unsuccessful. Orders for early delivery are now being taken subject to the ability of the furnaces to get transportation facilities. One local consumer bought 100 tons for immediate delivery and it was specified that the delivery should depend on getting cars. That was ten days ago. The cars have not been obtained yet.

The market shows distinctly more activity in Ohio silveries and car wheel grades. These have been rather neglected during the rush that has struck all the other grades and they have now been reached. Both these grades show an advance of about 50 cents a ton and there is a better demand and more inquiry. Southern furnaces report no relief in the car situation worth mentioning. They are getting rather used to this condition, however, and are making the best of it. Indications are that the railroads are doing their best not only to accommodate the demand for shipping facilities at the present, but to get in a position where they will be able to take care of what is ahead of them for the coming year. Prices on pig iron f. o. b. Cincinnati are as follows:

Southern Fdy. No. 1	$14 50 to $14 75	Gray Forge	$13 00 to $13 25
" " 2	14 00 to 14 25	Northern Fdy. No. 1	16 75 to 17 00
" " 3	13 50 to 13 75	" " 2	16 25 to 16 50
" " 4	13 00 to 13 25	Southern C.W. iron	18 25 to 18 75
So. Fdy. No 1 soft	14 50 to 14 75	Malleable coke iron	16 10 to 16 35
So Fdy. No. 2 soft	14 00 to 14 25		

FINISHED MATERIAL.—The market has been firmer and has shown more snap than in some weeks past. The demand is good and while there have been no advances there is no idea of making concessions. Manufacturers are buying bar iron freely and also taking other material steadily. In structural material contracts are being placed now for a good deal of construction work that is going ahead early in the spring and summer. Deliveries on all material are backward about as they have been, the bar men complaining that they would be able at least to keep up with their orders if they could get the raw material, which the scarcity of steel is making a hard problem for them. Safe manufacturers, builders, agricultural implement makers and all such lines are full of business and being sold up for a good part of the coming year are covering their wants for the next few months. Prices remain the same, bar iron selling at 1.62c Cincinnati; steel bars, 1.62c; angles, 2c; plates, 1.85c to 1.90c; sheets, No. 28, 3.35c to 3.40c; No. 12 blue annealed, 2.35c. Store prices are these with an sort of a premium that the stores see fit to ask.

OLD MATERIAL.—The scrap market is quiet and there is not much doing out of the ordinary. Wrought railroad is quoted even a little easier and other grades remain about the same, with the exception of old iron axles, which are firmer and command a slightly better price. There have been no large transactions, as far as can be learned. Some interests complain that the scrap men are holding old material too high but the prices given below are confirmed by some of the largest buyers as being about the market for the various kinds:

Old No.1 Wrought Railroad	$ 15 00 to 15 25
Cast Machine and Foundry	15 50 to 15 75
Old Iron Rails	20 25 to 20 75
Old Steel Rails	15 50 to 16 50
Old Short Lengths	14 00 to 14 25
Old Iron Axles	21 00 to 21 50
Old Iron Car Wheels	16 00 to 16 25
Stove Plates	9 75 to 10 00
Wrought Turnings, net tons	11 50 to 11 75
Cast Borings, net tons	5 50 to 6 00

The Ohio Blow Pipe Co. has established a modern plant at the corner of Seneca and Michigan Sts., Cleveland, for the manufacture of complete dust collecting systems, consisting of Cyclone dust collectors, furnace feeders, galvanized iron piping, hoods, etc., for the collection of dust and other refuse from foundries, metal polishing and buffing plants, wood working establishments, etc. The management comprises the following officers: Frank C. White, president; J. D. Swartwout, vice-president; Harry N. Clarke, secretary; D. K. Swartwout, treasurer, and Edward Coney, manager.

The Buckeye Steam Fitting Co., heating contractors, will move from the present location on River street to more commodious quarters at the corner of Broom St. and Court Place, Cleveland, and will add new and improved equipment. The firm has recently added to the machinery department a 16-inch Morris-Tasker pipe threading and cutting machine. It expects to be in a position to make the change in location about Jan. 1, 1902.

The New Castle Nut & Bolt Co., New Castle, Pa., effected an organization this week by electing Frank Ryan, president and manager; A. B. Whieldon, treasurer, and J. N. Martin, secretary. The company is capitalized at $75,000 and will manufacture bolts, chains and steel car forgings.

The Simpson Stove & Mfg. Co., of Pittsburg, has received a Pennsylvania charter with a capital of $50,000. The company will erect a plant at Canonsburg, Pa.

THE IRON TRADE REVIEW

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

DECEMBER 12, 1901.

TRADES UNIONS AND PROGRESS.

The convention of the American Federation of Labor had the machinery question before it at Scranton this week. Cigar-makers doing hand work asked for a boycott against machine-made cigars, on the ground that machines drive hand cigar-makers out of business. The convention refused to take such action, the speakers against the proposal advising the cigar-makers to organize the machine operators and adopt a wage scale as the typographical union and others unions had done on the introduction of machines. It was pointed out that opposition to machinery is folly and that the union could not successfully stand in the way of progress.

On similar arguments the opposition of union molders to molding machines was withdrawn at the Indianapolis convention of the union. Here the mistake the union molders had long made, of opposition to the machine, has told against their efforts to confine its operation to union men. The wide range of foundry work, moreover, and the comparative ease with which unskilled men have learned to operate the simpler machines, that are little more than squeezers, will operate to maintain a differential between various classes of foundry workmen and also, as machines come more and more into vogue, between various classes of machine operatives.

The short-sightedness of the policy of opposition to machinery is apparent to all intelligent members of trades unions, but opposition to progress in other directions is not so fast dying out. The day will come, we believe, when the opponents of piece work on a basis that gives the workman a fair share of the results of increased output, will be an unprogressive minority, just as the anti-machinery men are today The determination of output by decree, a heresy closely related to the anti-piece-work pronouncement, may survive longer than the others, but in the end all will find a common destination. Trade unionism, which is only a mechanism, a method of bringing to bear the united influence of craftsmen on the industrial problems of the time, must undergo an evolution just as every machine has done. The establishment of a minimum wage we believe to be its most legitimate and resultful line of operations. Maximum wages, the reward of maximum outputs and perfect work, should be open to the striving of every ambitious workman.

LOW-SILICON BESSEMER IRON IN THE BASIC PROCESS.

An interesting practice started recently is the use of rather low silicon Bessemer iron on the basic open-hearth. A number of basic open-hearth steel makers have recently been buyers of Bessemer pig iron in preference to basic for their work. The immediate cause of such purchases seems to have been the fact that basic iron in the open market has advanced to a point considerably above the dollar differential between it and Bessemer which formerly ruled.

More and more furnaces equipped with casting machines are making foundry iron, while the increased demand for Bessemer has changed some furnaces from basic to Bessemer, and the result has been a mild scarcity of basic iron which has put the price to within 25 or 50 cents a ton of Bessemer, and furnaces now are unwilling to make basic at a dollar a ton less than Bessemer. With such a firm market for non-Bessemer ores as has existed they are not so cheap as formerly compared with Bessemer ores, and this has helped to bring Bessemer working into favor with the furnaces. Outside the matter of ore cost, the manufacture of comparatively low silicon Bessemer iron is advantageous as compared with basic, since the furnace will stand a heavier burden, and can be operated with less coke and perhaps a slightly greater output, as compared with standard Bessemer. It is also the case that with the coke scarcity and the rapid working of furnaces there has been such a proportion of Bessemer iron made, running only, say, 1 per cent. in silicon that it has been difficult to make up converter mixtures running a full 1½ per cent in silicon. Such furnaces as had a large quantity of comparatively low-silicon Bessemer, and were equipped with casting apparatus, have found a convenient outlet for the material by selling it to basic open-hearth steel manufacturers. The possibility of using a larger proportion of the cheap Mesabi ores, which are as a rule low in silicon, is also a factor.

Inquiry in the trade develops the fact that some basic open-hearth steel manufacturers find that Bessemer iron works considerably better than basic iron and a preference is expressed for it on that account. Such a feeling does not exist among the largest users of the basic process, as they are able to eliminate the phosphorus without difficulty or extra expense so long as it does not run over, say, 0.4 or 0.5 per cent in the pig. A slightly greater quantity of lime may be required, but the amount is almost negligible. Where the practice is not so perfect however, trouble has been experienced, and in some cases this can be attributed to the fact that the phosphorus is eliminated early in the heat but is restored to the steel before tapping. This happens by the phosphorus forming phosphide of iron at the low temperature near the beginning of the heat, when samples taken show the phosphorus to have been eliminated. Later on, when the temperature is

higher, this phosphide of iron is decomposed and if there be not sufficient lime to absorb the phosphorus, it will return to the steel, and the chemist will be puzzled when he finds the steel as cast contains considerable phosphorus, although a test taken early in the heat showed it to have been eliminated.

In the best basic open-hearth practice, where direct metal is used, the preferable silicon content is between 0.6 and 0.7 per cent. More than this requires an undesirably large quantity of lime, and of course at the same time decreases the iron content, while a less quantity may produce skulling in the ladles. Where the pigs are melted on the hearth this difficulty of course is not met. An evident advantage of Bessemer pig over basic lies in the fact that whatever phosphorus is absent is supplied by iron, and with iron at $16 a ton even 1 per cent is no insignificant quantity. Comparing an open-hearth iron containing less than three-quarters of 1 per cent of silicon with a regular Bessemer mixture containing 1½ per cent, the saving of three-quarters of 1 per cent is also of some consequence.

It has generally been held that the existence of large bodies of ore in the United States very low in phosphorus, and with a high iron content, assured the permanence of the acid Bessemer process in this country for many years. With the use in the basic open-hearth furnace of iron made from these ores, but with a lower silicon content than if intended for Bessemer, and thus with a less coke consumption at the blast furnace and perhaps greater output, the trend toward the open-hearth may be more pronounced. L.

A record of over 28,000,000 net tons of freight through the canals at Sault Ste Marie in the season of 1901, the total to Dec. 1 being 27,817,811 net tons, is an impressive exhibit of the marvelous growth of traffic on the Great Lakes. There is a gain of nearly 3,000,000 net tons over 1900, and in 20 years, of more than 26,500,000 tons, the total for 1881 being 1,567,741 tons. When it is considered that more than 60 per cent of the freight through those canals the past season was iron ore, and that this ore was freighted at a rate less than 1 mill per ton mile, the value of the waterways on the north of the great iron-producing Middle West is given a double emphasis. The factors in American leadership in steel manufacture have been enumerated many times. Among the chief of these are the Great Lakes and the splendid development of modern steam freighters to which they have challenged latter-day enterprise.

Brass Fittings Manufacturers' Convention.

(Special Telegram.)

PITTSBURG, Pa., Dec. 11.—The annual convention of the Brass Fittings Manufacturers' Association, which opened here Monday, came to a close last night with a banquet at the Hotel Lincoln. One of the most important matters under consideration was the adoption of a uniform standard of patterns for the trade. The election of officers resulted as follows: A. D. Sanders, Chicago, president; C. K. Sanborn, New York, vice-president; J. B. Kalvelege, Milwaukee, treasurer, and William S. Doyle, Milwaukee, secretary. Tomorrow the delegates to the convention will meet in Washington to discuss trade topics and it is probable that a price agreement will be discussed.

IMPORTANT DEALS OF YOUNGSTOWN IRON SHEET & TUBE CO.

(Special Telegram.)

YOUNGSTOWN, O., Dec. 11.—The Youngstown Iron Sheet & Tube Co. closed a deal on Tuesday for the purchase of the Alice Furnace of Pickands, Mather & Co., in Sharpsville, and contracted for a 10 years' supply of Lake Superior ore for the Alice and a new stack to be built together with a 600-ton steel plant in connection with the works now going up here. Negotiations are on for coking coal properties and ovens. The capital stock will be increased from $2,000,000 to $4,000,000. It is possible that $1,000,000 of the latter will be in bonds. This will be decided on at the next meeting of the board of directors. In Cleveland, Tuesday, President Geo. D. Wick sold a large block of stock to interests connected with Pickands, Mather & Co. Mr. Wick will also recommend doubling the present sheet capacity or the building of 10 tin mills and the erection of another large skelp mill and pipe mill to roll up to 12-inch tubes. These deals will give the company entire control of all material from the raw state to finished forms. President Wick authorized these statements today.

LAKE SUPERIOR IRON MINES.

A statement has been made up of shipments of iron ore from the Mesabi and Vermillion ranges in the season just closed. It shows a total sent over the three Minnesota railroads of 10,786,923 tons, as against 9,424,861 tons last year, or an increase of 1,362,815 tons. The totals by roads in the two years were as follows:

	1901	1900
Duluth & Iron Range.....	5,028,765	4,012,920
Duluth, Missabe & Northern.	3,437,158	3,888,941
Eastern Minnesota	2,321,000	1,523,000
	10,786,923	9,424,861

The falling off in the shipments by the Missabe road is due chiefly to the difference between the 1900 and the 1901 shipments from the Biwabik mine, this year's record showing a falling off of more than 500,000 tons. The conspicuous record is that of the Fayal, which shipped 1,656,836 tons, as compared with 1,252,504 tons last year. This is the greatest output ever made by a single iron mine. The Mountain Iron is still above the 1,000,000 ton mark. On the Vermillion range it is noteworthy that the Minnesota and Chandler have both fallen off from last year and that the Pioneer's output exceeds that of the famous Chandler. The shipments over the Duluth & Iron Range road were as follows:

	1900	1901
Minnesota	325,020	208,284
Chandler	644,801	627,322
Pioneer	450,794	678,301
Zenith	60,089	60,037
Savoy	175,116	212,007
Auburn	263,692	427,510
Fayal	1,252,504	1,656,836
Elba	121,707	224,629
Genoa	253,651	332,021
Sparta	202 144	154 557
Roberts	41,965	42,757
Hale	32,901	30 972
Malta	65,346	128,220
Kanawha	64,218	41 300
Spruce	101,675	47,628
Union	8,397	93,109
Franklin	168,524	36 430
Corsica		26,837
Total	4,232,514	5,028,765

Shipments by mines over the Duluth, Missabe & Northern road were as follows:

	1900	1901
Adams	777,321	829,118
Duluth	138,587	150,024
Pillsbury	101,032	110 708
Sellers	56,280	34,918
Burt	99,849	118,160
Hull	55,101	302,462
Rust	116,261	174,156
Ohio	173 597	
Franklin	149 535	2,410
Biwabik	924,868	410,075
Mesabi Mountain Iron	76,871	5,420
Lone Jack	168 004	
Mountain Iron	1,001,324	1,058,160
Spruce	61,311	231,547
Total	3,888,941	3,437,158

Subtracting the Vermillion range shipments from the total sent over the three roads gives about 9,000,000 tons for the Mesabi range, or about 44 per cent of the total shipments of the year.

PHILADELPHIA MARKETS.

Dec 10.

As yet orders can not be placed for pig iron, billets, and structural material with any assurance of deliveries within a definite period, so well is this part of the trade sold ahead. In other products of the mills an easier feeling prevails, without showing any effect on prices. There is an inclination to look for slightly higher prices during the first half of the new year, although the falling off in export demand and increase in productive capacity at home may tend to equalize the exceptional volume of business planned for 1902.

Pig Iron.—The furnaces of this vicinity have so little iron available for immediate delivery, that they are practically out of the market, except for business which does not involve delivery until after the beginning of the year. No. 2 X foundry is quoted at $16 and even at this figure but little iron is available before February 1. A shading of 25c a ton could probably be had on contracts covering six months, though it is very evident that the pressure to buy is much stronger than the pressure to sell, and makers are believed to be seriously considering a further stiffening of prices, should the extreme scarcity and general strong situation continue. The condition of the market makes it difficult to quote an average figure for all transactions, but prices for Philadelphia and nearby points range about as follows: No. 1 X foundry, $16.25 to $16.50; No. 2 X foundry, $15.75 to $16; No. 2 plain, $15.25 to $15.50; standard gray forge, $14.25 to $14.50; ordinary gray forge, $13.75 to $14; basic (chilled), $14.25 to $14.50; Bessemer, $15.75 to $16.

Finished Material.—The demand for plates has been very active and quite a few good sized orders have been placed in addition to the regular run of small orders. The mills are believed to have work enough on hand to carry them through the winter months. The bar mills are not provided for to the same extent as the plate mills and several experience temporary shortages of orders, although the general outlook is favorable for a large business during the coming year. In sheets and structural material the mills are so far behind in catching up with their order books that no prospect of a change is in sight for the present. We quote for seaboard and short distance deliveries: Plates, ¼-inch and thicker, 1.75c to 1.80c; bars, iron or steel, 1.62½ to 1.70c; angles, 1.75 to 1.85c; beams and channels, 1.75c to 1.85c.

Old Material.—There is a fair demand, with somewhat irregular prices, though on the whole favorable to a stronger market, bids and offers for deliveries in buyers' yards being about as follows: Choice railroad scrap, $20.50 to $21; ordinary light scrap, $12.50 to $12.75; machinery cast, $14 to $14.50; heavy steel scrap, $17.50 to $17.75; old iron rails, $21 to $21.50; old steel rails, short lengths, $17.50 to $17.75; wrought turnings, $12.75 to $13.25; cast borings, $8 to $8.25; old car wheels, $16 to $16.50; old iron axles, $24 to $25; old steel axles, $19.50 to $20.50.

The Keystone Mfg. Co., of McKeesport, Pa., commenced operations this week in its new foundry. The plant is modern in every particular and consists of a foundry building 60x100 feet and a fitting and machine shop 30x212 feet. The company will manufacture stoves, ranges and small castings. W. E. Hartman, J. L. Delong, C. F. Delong, C. T. Moore, W. F. McCrea and R. Harris are the incorporators.

A company has been organized at Scottdale Pa., to rebuild the machine shops of Kenney & Co., recently burned. There has been subscribed $125,000 and the shops will be rebuilt on a larger scale than before, employing 200 men, as against 65 in the old shops. A board of directors has been chosen as follows: A. K. Stauffer, T. C. Kenney, D. B. Stauft, Robt. Skemp, E. A. Humphries, J. R. Smith, J. I. Dick, E. L. Rutnerford, all of Scottdale, and Worth Kilpatrick, of Connellsville. The officers chosen are: A. K. Stauffer, president; D. B. Stauft, secretary, and Walter F. Stauffer, treasurer.

The Bradford Metal Stamping & Machine Co., Bradford, Pa., has been incorporated with $20,000 capital.

NO EASTERN PLATE MILL CONSOLIDATION.

The proposed consolidation of Eastern plate manufacturers, to include the Tidewater Steel Co., Lukens Iron & Steel Co., Central Iron & Steel Co., and Worth Bros. Co., has been abandoned. The deal was all but consummated several weeks ago, the financial features having been adjusted to the satisfaction of all concerned. A few details still remained to be settled and at the time the announcement was made that the deal had gone through it was fully believed that these details would be adjusted satisfactorily. One of the concerns, however, refused to agree not to enter the plate business again for the stipulated period and owing to this refusal the project fell through. At present it is not probable that another effort will be made to put through the consolidation.

The Mesta Machine Co., Pittsburg, Pa., has been awarded a contract by the LaBelle Iron Works, Wheeling, W. Va., for a large steam shear to weigh approximately 125 tons, that will cut hot steel 4x38 inches. The shear will be driven by an 18x20 vertical engine. The contract for the engine was also awarded the Mesta Machine Co. The shear is to be used in connection with the large blooming mill, which is now being built by the Mesta Machine Co. for the LaBelle Iron Works. This will be the largest mill of its kind ever built. The Alan Wood Iron & Steel Co., Conshohocken, Pa., placed an order with the Mesta Machine Co., for a pair of piston valve reversing engines, 50x60. These are to be direct connected and will be used for driving the new blooming mill that the Alan Wood company will install. The contract for a pair of 46x60 reversing engines, geared 5 to 7, for operating their new blooming mill has also been placed with the Mesta company by the LaBelle Iron Works.

The Stanyon Engineering Co., Empire Building, Pittsburg, Pa., has opened an office in room 402, McKinnon Bldg., Toronto, Ont. This company designs and installs steel works and rolling mills, rod mill plants, wire mills, galvanizing plants, nail, fence and barb wire factories. It designed and built a portion of the plant of the Union Steel Co., Pittsburg, wire mill of the Kokomo Steel & Wire Co., Kokomo, Ind.; furnished machinery for the Sharon Steel Co., and is acting in the capacity of consulting engineer for the Cramp Steel Co., Collingwood, Ont. The Toronto office of the company will also act as buyer's agent for Canadian consumers of iron and steel products manufactured in the United States. Matters relating to duties and customs will be attended to for the buyer.

Owing to the breaking of a housing of the blooming mill at the Edgar Thomson plant of the Carnegie Steel Co., Braddock, Pa., the rail mill was shut down for 36 hours this week.

The plant of the British Westinghouse Electric & Mfg. Co., Manchester, Eng., will be placed in operation about March 1, 1902.

Owing to improvements made to the guide mills at the various plants of the American Steel Hoop Co. and the Republic Iron & Steel Co., in the Youngstown, O., district, the officials of these companies have notified the Amalgamated Association that they desire to take advantage of that clause in the scale which permits of a readjustment in the middle of the scale year. The men claim that the improvements made to the mill are not of such a nature as to require a change in the guide mill scale, but the two companies assert that the output is materially increased and that for this reason there should be a reduction in the scale. Several conferences have been held at Youngstown, O., between the manufacturers and the association but no agreement has yet been reached.

At the pig iron casting plant of the Sharon Steel Co., South Sharon, Pa., an explosion occurred on Tuesday, Dec. 10, which made a bad wreck of the building and the casting machinery and injured several men, two seriously. As the ladle was tipped the molten metal came in contact with water.

A Bonus System of Rewarding Labor.*

BY H. L. GANTT, SOUTH BETHLEHEM, PA.

The system described in this paper has recently been introduced by the writer into the large machine shop of the Bethlehem Steel Co., and has met with such unqualified success that a description of it would seem to be of interest to the society. It is an attempt at harmonizing the interests of the employer and employe, and, while it affords substantial justice to the employe, requires that he shall always conform to the best interests of his employer. That it accomplishes such a result, at least in a measure, is shown by the fact that it has caused a complete change in the whole atmosphere of a shop, notwithstanding the fact that it has been in operation for a few months only.

The System Described.

A card is made out, showing in detail the best method (so far as our present knowledge goes on the subject) of performing each of the elementary operations on any piece of work, specifying the tools to be used, and setting the time needed for each of these operations as determined by experiments. The sum of these times is the total time needed to complete the piece of work. If the man follows his instructions, and accomplishes all the work laid out for him, as constituting his proper task for the day, he is paid a definite bonus in addition to the day rate which he always gets. If, however, at the end of the day, he has failed to accomplish all of the work laid out, he does not get his bonus, but simply his day rate. As the time for each detail operation is stated on the instruction card, the workman can see continually whether he is earning his bonus or not, and if he finds any operation which cannot be done in the time set, he must at once report it to his foreman. If, on careful investigation by the man making out the card, the workman's statement is found to be correct—that a portion of the task can not be done in the time stated on the card—a new instruction card is made out, explaining the proper method of working, and allowing the proper time. It is of the greatest possible importance for the moral effect upon the men that errors in making out instruction cards should be as few as possible. A man must be allowed time only for what is stated on his card, and while a reasonable time must be allowed for each operation, he should fail to receive his bonus if time is lost from any cause whatever. (The foremen also receive, in addition to their day wages, compensation proportional to the number of their men who earn a bonus, and an extra compensation if all of their men earn their bonuses.)

As these cards are made out by a skillful man, with the records at hand, they invariably prescribe a better method for doing the work than the ordinary workman or foreman could devise on the spur of the moment. As all the appliances and instructions necessary for doing the work are furnished, and a fixed premium or bonus is allowed the workman in addition to his regular rate if the work is done satisfactorily in the time set, it will be seen at once that this method is really a system of education, with prizes for those who learn, and the results already obtained bear out this idea of education most fully, for under it men have learned more in a few months than they ever did before in years.

A careful consideration of this system will show that, while it is not a system of piece work, it has many of the advantages of differential piece work, by which I mean that the compensation is quite large for the maximum amount of work obtainable, and quite small for anything less than this amount. For instance, if a man does all that is asked of him, which must always be possible, he gets a large extra reward; but he gets no reward, except his ordinary day rate, if he falls short of this amount. The extra bonus which the bosses earn when all of their men perform the maximum amount of work is a strong inducement to make them teach their inferior men.

Again, as it is impossible for the men to earn their bonuses when their machines are out of order, it furnishes an automatic punishment for breakdowns, for the man not only loses his bonus on the day the machine breaks down, but on all subsequent days until the machine is running satisfactorily again.

This system is, so far as the writer is aware, a new one, but is based on the principles of Mr. Fred. W. Taylor's system of elementary rate fixing (see paper No. 647, "A Piece Rate System," *Transactions*, vol. xvi., p. 856), and is as far as possible removed from the old-fashioned method of fixing piece rates from records of the total time it has taken to do a job. It possesses an advantage over direct piece work in that it is more flexible and can be introduced with greater ease and under conditions where piece work proper would be impossible. When it is realized that proper piece work will, in many cases, produce at least three or four times as large an output as ordinary day work, the difficulties of putting directly on piece work men who have been accustomed to doing work in their own way and in their own time would seem to be, and generally is, extremely difficult. While the men who are on day work usually realize that they are not doing all they can do, when they are told that it is possible to do three or four times as much as they are doing they simply do not believe it, and it is very difficult to make them accept as just a piece rate founded on this basis; but a reward in addition to their day rate constantly held before them will finally be striven for by some one, and when one has obtained it others will try for it. In other words, if the instruction card is made out and a substantial bonus offered, time will do the rest.

How the Rate Basis is Determined.

In order to get the information necessary to fix proper piece rates, or even to make out good instruction cards, a very large amount of detail work is necessary. When we realize, however, that any operation, no matter how complicated, can be resolved into a series of simple operations, we have grasped the key to the solution of many problems. Further study leads us to the conclusion that many complicated operations are composed of a number of the same simple operations performed in a different order, and frequently that the number of elementary operations is smaller than the number of complicated operations of which they form the parts. The logical method, therefore, of studying a complicated operation is undoubtedly to study the simple operations of which it is composed, a thorough knowledge of which will always throw a great deal of light on the complex operation. In other words, the time needed for performing any complex operation must necessarily depend upon the time and method of performing the simple operations of which it is composed. The natural method, then, of informing ourselves about a complex operation is to study its component elementary operations. Such study divides itself into three parts, as follows:

An analysis of the operation into its elements.
A study of these elements separately.
A synthesis, or putting together the results of our study.

This is recognized at once as simply the ordinary scientific method of procedure when it is desired to make any kind of an investigation, and it is well known to all that until this method was known and adopted science made practically no progress, and the writer believes that if it is desired to obtain the correct solution of any problem we must follow the well-beaten paths of scientific investigation, which alone have led to reliable results. The ordinary man, whether mechanic or laborer, if left to himself, seldom performs any operation in the manner most economical, either of time or labor, and it has been conclusively proven that even on ordinary day work a very decided advantage can be gained by giving the men instructions as to how to perform the work they are set to do, and, when these instructions are the result of scientific investigation, the gain in efficiency is usually beyond our highest expectations.

It is perfectly well known that nearly every operation can be, and in actual work is, performed in a number of different ways; but it is self-evident that all of these ways are not equally efficient, when we consider that the object to be attained is to accomplish the greatest amount of work in the shortest time, and with as little expenditure of energy as is consistent with quickest work. As a rule, some of the methods employed are so obviously inefficient that they may be

*Read at the New York meeting (December, 1901) of the American Society of Mechanical Engineers.

discarded at once, but it is often a problem of considerable difficulty to find out the very best method, and it is only by a scientific investigation of all the elements of the operation that we can hope to arrive at even an approximate solution of the problem.

Mr. Fred. W. Taylor, who was the pioneer in this work of elementary rate fixing which involves complete detailed instructions, began to work on these lines in 1880, and soon became convinced that they were correct. He has fixed a large number of rates, all of which are lower than those usually paid, but as he takes care to furnish the best implements for doing the work, and insists that the work shall be done as he instructs, the good men always make better wages than they can where they are allowed to do the work with the implements and in the manner they see fit. His piece rates, founded on careful investigation, and with an earnest attempt to do justice both to the employer and the employe, have produced not only a much greater output than any other method in the works where they have been introduced, but a much better feeling among the men towards their employers. The fact that during the past 20 years a great many such rates have been introduced, always with the same result, is a confirmation of the correctness of the principles on which they are based, and leads us to the conclusion that a strict adherence to these principles and a desire on the part of employers to do substantial justice to their employes, would in a short time materially lessen the antagonism between employers and employes which seems at present to be so prevalent.

The scientific method of investigation of the elements into which every operation may be divided, is then evidently a satisfactory basis for fixing piece rates, and it should always be employed whenever it is desired that the rates shall be permanent. To analyze every job and to make out instructions as to how to perform each of the elementary operations requires a great deal of knowledge, much of which is very difficult to acquire; but the results obtained by this method of working are so great that the expenditure to acquire the knowledge is comparatively insignificant.

In this connection, it is, perhaps, well to call attention to the article on "The Taylor-White Process of Treating Tool Steel," by Mr. Charles Day, in the September number of the Journal of the Franklin Institute, in which he makes a strong plea for scientific investigation. Mr. Day's criticism of the ordinary guess-work methods may be severe, but when the difference between guess and scientific investigation has been fully realized, it will seem very mild.

Instruction Cards.

When a piece rate is made out for any kind of work with which the men are not thoroughly familiar, it is obviously only simple justice to them that they should have detailed instructions as to the way to accomplish each of the elements of the work in the time needed to earn fair wages. Permanent piece rates can be made out only when the instructions are such as will accomplish the work in the minimum time, and to get sufficient information to make out instruction cards suitable for a piece rate basis is often a long and tedious operation. On the other hand, instruction cards may be made out to show the best method of doing the work which we can devise with our present knowledge and appliances. Such cards will seldom represent the very best method of performing the work, but will usually represent a method far superior to that which the ordinary workman would employ, and if we can get the men to do the work as directed on these cards, we can very largely increase the efficiency of their work. This is a most obvious way of increasing our output when we have not sufficient information to make out permanent piece rates. To base a piece rate on such an instruction card would be simply inviting trouble, as but few men could see that it was just to change a piece rate when we changed the method of doing the work. If, on the other hand, we allow the men their day rate and offer them a bonus or premium for doing the work in accordance with our instruction cards, they see at once that they have nothing to lose by conforming to our wishes, and all to gain, with the result that they will in a short time make an effort to do the work in the manner and time set. As we stated in advance, these instruction cards do not necessarily represent the best possible method of doing the work, but the best method which we could devise at the time, and we have found that there is practically no objection on the part of the men to a change of time on these cards, so long as the new time corresponds to a new set of instructions which will enable them to perform the work in the time set.

It is hard to over-estimate the value of a complete set of instructions showing the best method of performing a piece of work, and when we come to consider the question of piece work, the payment of a bonus, or, in fact, any method of compensation except that of straight day work, proper instructions embodying our best knowledge on the subject are absolutely essential, if we wish to obtain the best results.

Application of Instruction Cards to a Machine Shop.

In order to make proper instruction cards for a machine shop doing a variety of work, it is necessary to know the laws of the cutting of metals, as well as the time for handling work in this particular shop. The laws referred to are very complicated, but here again, Mr. Taylor has made such a start as to render it possible to determine the best method and time for rough-machining steel. The results of his experiments on lathes were reduced to a slide rule by the writer for convenient use. This slide rule has been improved by Mr. Carl G. Barth, who has also extended it to planers, drill presses, and slotters, and who made out slide rules for a number of machines in the large machine shop of the Bethlehem Steel Co. By means of these slide rules we can determine promptly the most economical feed and speed with which to perform any operation on a piece of steel when the physical qualities of the steel are given. As an illustration of exactly how instruction cards are made out in a machine shop, we may cite the case of a forging that has to be rough-machined. The drawing first goes to an expert mechanic, who has charge of what is known as the routing of the piece through the shop. He decides the order in which the various operations of turning, planing, slotting, drilling, etc., are to be done. In a shop doing a variety of work, too much stress cannot be laid on the routing, for, besides the advantage of knowing in the office the progress of the work, the saving made by performing the various operations in the best order is very great. This subject of routing is large enough to take up a paper by itself, so it can only be mentioned here. If the first operation to be performed is that of turning, the forging is assigned to the lathe best fitted for handling this particular job. The work to be done on the machine is then analyzed by a first-class machinist, who has been instructed in the use of the slide rule, and who makes out an instruction card on which the operations to be performed on this lathe are placed in the proper order, with proper instructions, the calculated time being given for performing each operation. The kind of tool to be used, the feed, and speed are specified for every machine operation. For every other operation, such as putting in and taking out work, laying out, changing feed gears, etc., instructions are given, and the time that each should take is placed directly opposite the description, in a column designed for that purpose.

Fig. 1 is a sample card for rough-turning a locomotive piston rod. This card represents instructions given to William Jones, whose boss is Thomas Smith, to do work on Forging No. 14, 653C4, Manufacturing Order No. 17,344 in Lathe No. 145, according to Standing Order No. 376. The hardness of the metal is represented by class 12. He must use tools made of "M E" steel, of the shape designated in the column calling for shape of tool. The approximate depth of cut in turning is 3-16 inch. "J" represents a combination of feed gears, and "2-BF" a cone speed which he must use. Opposite each operation are seen complete instructions giving the kind of tool, cut, feed, and speed that must be used in order to accomplish the work in the time set. The total time for turning and facing this forging is shown to be 42 minutes. At the bottom of this card is given, first its number, then the drawing number of the assembling sheet, if we have such a sheet; then the detail drawing for this particular piece, and next the date and signature of the man who made out the card. The note at the bottom, namely: "When machine cannot be run as ordered, speed boss must at once report to the man who signed this slip," is put on in red ink and should be observed to the letter.

By means of this card filled out from the slide rule, together

with records of the time necessary to do miscellaneous operations, which for simplicity we shall call "hand work," we can instruct a very ordinary man in the best method of doing any job of this character. Considerable training, of course, is necessary to teach the men, who, as a rule, are ordinary laborers, to follow these cards. Having once given them this training, however, the advantage of having a first-class machinist to do the thinking, and to use for them the best results already obtained, produces an efficiency which would be absolutely impossible if the workmen were left to themselves.

For further illustration I give three more cards (Figs. 2, 3 and 4), which are made out in the same manner as the first one. One of these is for a far more complex operation, and it may be of interest to note that cards are frequently made out that are twice as long as this one.

This system of instruction cards was introduced by the writer into Machine Shop No. 2, of the Bethlehem Steel Co., in June, 1899, with markedly beneficial results, which increased as the men making out the cards became more and more skillful and the cards were made out more and more in detail. There was comparatively little difficulty in causing the men to perform the automatic operations according to the instructions given. For instance, they would run their machines at the feed and speed called for, but the great difficulty was that it seemed impossible to prevent them from losing time between operations. One would frequently find many of the machines idle, and yet every workman could give a more or less plausible excuse why his machine was not running, and this in spite of the fact that tools were ground for him and furnished to him, and the work so prepared that all he had to do was to put it in the machine and begin cutting. In other words, no matter how efficiently the machines were run shop very materially.

cuses for taking more than the prescribed time on every job, through their actual working time, the men found good ex- and for wasting enough time to hold down the output of the

The Bonus and Its Results.

To overcome this difficulty it was proposed by the writer that every man who succeeded in doing all the work called for by his instruction cards for a complete turn should receive a bonus, or premium. When this payment of a bonus went into effect, the amount of time wasted diminished very rapidly, and soon a majority of the men on the machines were earning their bonuses regularly. In order to be sure that they got all the assistance possible from the foreman, he, too, received a definite premium for each machine under his charge that made its bonus, and in order that the poorer men might receive sufficient instruction from the foreman, it was made to his interest to give them special attention. That was accomplished in this way: While the foreman was given a definite amount for each machine that earned its bonus, he was given an additional fifty per cent if all the machines under his charge earned their bonus, thus making it to his interest to give special attention to the men most likely to fall behind.

Inasmuch as no bonus whatever is paid unless the men actually perform the work called for on their instruction cards in the time set, it is to the interests of the men to prevent accidents to the machines, and to avoid unnecessary delays, whether such delays are their own fault or the fault of other people. Among the results we have obtained are:

1. A very large increase in output, averaging from 200 to 300 per cent.
2. A falling off in accidents and breakdowns.
3. A quickening of the intelligence of the men.

For instance, men who could formerly do nothing for themselves, but were obliged to ask the foreman all kinds of questions, now find that they can do the work by asking fewer questions, for if they spend a large proportion of their time hunting the foreman they lose their bonus. One man, for instance, who in three years had never learned to change the feed gears of his machine properly without the assistance of his foreman, lost his bonus three days in succession because they had not been properly set. He at once learned to set them, and has had no difficulty from this cause since.

Comparison of Bonus System and Piece Work.

In making a comparison between the bonus system and proper piece work, it will be recognized at once that each has its advantages. If we have a thorough knowledge of all the conditions, and are able to introduce piece work, it is undoubtedly to be preferred; but we must remember that, aside from the injustice, there is nothing so demoralizing as cutting piece rates, and it is not only extremely difficult to make out proper piece rates, but it is still harder to convince men who have been accustomed to working by the day only, that it is possible for them to earn fair wages when proper rates are set. On the other hand, as the bonus is paid to men in addition to their day rate for performing the work in the manner and time called for by their instruction cards, they do not feel so hostile toward the innovation. These cards do not pretend to represent absolutely the best possible method, but the best method we can devise with the present state of our knowledge, and while they may be changed as our knowledge increases, they are always intended to describe a method which is within the ability of a good man to reach. The difficulty of introducing such a system is far less than that of introducing direct piece work, for if workmen, having secured to them their day wages, are given such instruction cards, and a considerable reward is held out to them for doing the work in the manner and time called for in the instruction cards, they will gradually overcome their prejudice against following instructions, and finally attempt to perform some of the operations in the time set. Having performed a few of these operations, and finding out that the card represents a fair and reasonable set of instructions, they will, in a short while, conclude that they might as well have the extra pay, and gradually learn to follow the whole card. This has been the experience of the writer, and he was surprised to find out how quickly the men overcame their prejudice. Before the introduction of the bonus, no man was willing to ask somebody else to hurry in order that he might get his work done, for the man spoken to would resent such a request as an insult. Men seldom complained to a foreman that they were being interfered with, but simply sat down and waited, and would sometimes wait for a crane by the hour. Now all are up in arms against anybody who does not serve them almost instantly.

The greatest difficulty to be met is to convince the men that these instruction cards are intended to be such as a man familiar with the work can, by due industry and with a fair amount of intelligence, always follow successfully; but when the men are once convinced that this is a fact, and that it is the intention of the company to allow them to earn the reward indicated for the extra work, most of the difficulties are over. To make out such cards requires an amount of knowledge and experience that is seldom the possession of any one man. To obtain this information requires a long series of detail observations and investigations with corresponding records, and even after having obtained a great deal of such information, most of our instruction cards will still fall far short of perfection. They are intended to represent our best knowledge of how to perform the work, and the man following the card earns his bonus not because he does the job in the best possible way, but because he does it in the manner which the present state of our information indicates is the best. If subsequently to having made out a card for a certain job we have obtained more information on that job, and find an easier and quicker method of doing the work, our instruction cards may be made to conform to the new and better method, but only such items on the instruction card should be changed as are affected by this new and better method. In other words, no wholesale change in a card is allowable under any conditions. It must be possible always to perform the individual elementary operation in the time set, and when a man complains that he can't do this, he must be asked to point out the individual operation or operations that he can't do; if the foreman cannot show him how to perform these operations in the time set, the matter should at once be referred to the man making out the instruction cards, who must either be able to show how to carry out the instructions given, or change the instruction card so that it can be followed. This throws the responsibility for the success of the system on the man making out the instruction cards, who should not only be a good mechanic, but a man of the highest order of intelligence and integrity, for he practically fixes the pay of the men, and is, in

a large degree, responsible for the output of the shop. This is true, whether the instruction cards are made out for a bonus system or for piece work, and unless a proper man is selected to have charge of this work, the whole system, whether that of paying a bonus or piece work, will immediately fall into disrepute. As I have said before, piece work, when proper piece rates can be made, is preferable to a bonus system, but the delay in getting sufficient knowledge to fix permanent piece rates is often so great that it is absolutely necessary to resort to some shorter method for obtaining an increased output, and the bonus system as outlined here, or some modification of it based on the instruction card, is a very efficient means of accomplishing this end, and one which is easily introduced because it avoids raising issues with the men.

The system as described here is specially applicable to work done on automatic machine tools, where efficient running of the tools counts more than manual dexterity. If, on the other hand, the work is such that manual dexterity or strength is the main factor, it will be usually necessary to offer, in addition to the bonus for maximum efficiency, one or more bonuses for

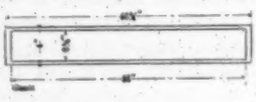
CLASS OF WORK: *Lathe* | STANDING ORDER: *376* | ORDER NUMBER: *17344*

MACHINE NO.: *145* | TOOL: M E H | CLASS OF METAL: *12* | FORGING NUMBER: *146536 4*

MAN'S NAME: *Wm. Jones* SPEED BOSS: *Thos. Smith*

	DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
1	*Chuck*					2.5		
2	*Face end*	*P V M*			*2 B F*	4.0		
3	*Turn half way*	*P R L*	⅛	*J*	"	12.0		
4	" *end for end*					5.0		
5	" *half way*	*P R L*	⅛	*J*	"	12.0		
6	*Face end*	*P V M*			"	4.0		
7	*Remove from machine*					2.5		
8						42.0		
9								
10								

11 Inside lines in sketch represent machined, and outside lines forged, sizes.

12–16 

17 NOTE.—Sketches are not usually put on the instruction cards, but are put on here for convenience.

18–23

INSTRUCTION CARD NO.	SHEET DRAWING NO.	B. S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
4327		*26637¼e*	*6*	*1*	*1901*	*Buckley*

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

FIG. 1.

definite approximations to this maximum. This, however, is one of the numerous modifications that will suggest itself when a proper system of instruction cards and records has been introduced.

Results of Improved Management and the Bonus.

To show what has already been accomplished, I append some notes which, of themselves, may be of interest. The first is an official report made to Mr. E. P. Earle by his able assistant, Mr. R. J. Snyder, in less than two months after the bonus system had been started. Mr. Snyder had special charge of the working of the system, and speaks with authority.

BETHLEHEM STEEL CO., Department D. M.

SO. BETHLEHEM, PA., *May* 13, 1901.

MR. E. P. EARLE,

Supt. of Machine Shop No. 2.

Dear Sir:—I hand you herewith some notes on the results obtained by the introduction of the "bonus" plan for remunerating labor in No. 2 Machine Shop.

The plan thus far has been applied only to the roughing lathes, and I give below a list of the numbers of the machines, with the dates on which they began operating under a bonus or premium:

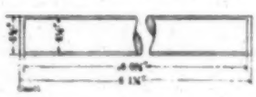
Lathe, No.	76	March	18, 1901.	Lathe, No.	60-A	April	4, 1901.
" "	158	"	19, "	" "	60-B	"	5, "
" "	159	"	19, "	" "	90	"	8, "
" "	50-A	"	19, "	" "	30	"	24, "
" "	50-B	"	19, "	" "	55	"	24, "
" "	145	"	20, "	" "	72	"	29, "
" "	146	"	20, "	" "	73	"	29, "
" "	160	"	20, "	" "	4-A	May	6, "
" "	208	"	28, "	" "	4-B	"	6, "
Lathe, No.	207	April	3, 1901.	" "	34	"	9, "

One of the best results obtained after a short trial has been the moral effect upon the men. They have had it placed in their power to earn a very substantial increase in wages by a corresponding increase in their productive capacity, and this has given them the feeling that the company is quite willing to reward the increased effort. They display a willingness to work right up to their capacity, with the knowledge that they are not given impossibilities to perform. This effect has been brought about by the good use of our excellent slide rules in the hands of a number of the most thoroughly practical men, who, when the results which they demand have been declared impossible to obtain, have repeatedly gone out into

CLASS OF WORK: *Lathe* | STANDING ORDER: *580* | ORDER NUMBER: *17058*

MACHINE NO.: *76* | TOOL: M E H | CLASS OF METAL: *26* | FORGING NUMBER: *22534 B 1 F2*

MAN'S NAME: SPEED BOSS:

	DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
	Change machine 10 minutes (for 1st one only)							
1	*Chuck*					04		
2	*Turn half way*	*P R L*	⅛"	*E*	*3 A F*	30		
3	*Face end*	*P V M*			"	17		
4	*Turn end for end*					06		
5	*Face end*	"			"	17		
6	*Turn half way*	*P R L*	"	"	"	30		
7	*Remove piece*					03	hr. min.	
8						1:47	1:30	
9								
10		(*Bonus not earned*)						
11								
12								
13								
14–16								
17								
18								
19								
20								
21	*Previous time on another lathe 5¼ hrs.*							
22								
23								

INSTRUCTION CARD NO.	SHEET DRAWING NO.	B. S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
5618	*P C A C*	*26539¼ C*	*9*	*18*	*01*	*Buckley*

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

FIG. 2.

the shop and themselves demonstrated that the time was ample, by doing the work well within the limits set. All this has inspired the confidence of the shop hands, and the excellent instruction cards sent out are gradually evolving from laborers a most efficient lot of machine hands.

The percentage of errors in machining has been very materially reduced, which is unquestionably due to the fact that in order to earn his bonus a man must utilize his brains and faculties to the fullest extent, and so has his attention closely fixed on the work before him, as every move must be made to count. He thus has no time for dreaming, which was, no doubt, the cause of many errors.

The condition of the machines is vastly improved. Much care has been taken to point out to the men that the best results can be obtained only by keeping their machines in good running condition, well lubricated and cleaned. They have not been slow to realize this, and cases of journals cutting fast are very rare, while before the introduction of the "bonus" plan this was a very common occurrence. Breakdowns are also of a less frequent occurrence.

The crane service lately has given us little trouble, and lack of crane service was formerly a constant excuse of the bosses and men for not being able to keep machines filled with work. The improvement in this case arose from the rule laid down

that no exceptions or allowances would be made for delays due to this cause.

It is only by the introduction of this "bonus" plan that we have had furnished the automatic incentive for the men to work up to their capacity, and to obtain from the machines the product which they are capable of turning out. It has lifted the hands of the speed bosses (foremen) and enabled them to act in the capacity for which those positions were created—that of instructors.

These are some of the direct results obtained. Indirectly it has eliminated the constant necessity for driving the men, and has enabled the shop management to divert some of its energy into perfecting the organization, which only will enable us to give a good account of the shop equipment. Much good has also resulted from putting the work through in lots, and in keeping each machine as nearly as possible on the same kind of work.

It is also a pleasure to note in this connection the deep interest taken in this work by the men connected with it, and the fine co-operative spirit which prevails among all hands.

Yours truly,

R. J. SNYDER.

Reduction of Machine Time.

The following table shows the reduction of actual machining time under improved methods of management, and the introduction of instruction cards and a bonus system.

Column No. 1 gives the time taken to do work under the old system of day work where one foreman had charge of a large number of men, and each man was left practically to himself, to do the work the best way he could with whatever tools he saw fit, and to keep his machine in the condition he preferred. Column No. 2 gives the time taken to do the same work when a proper number of trained foremen (speed bosses) had been appointed, a proper system of caring for belts and machines adopted, and proper appliances and instruction cards furnished the men. Column No. 3 represents the time after the bonus system had been applied to the conditions of Column No. 2.

This work was all done under the supervision of Mr. Fred. W. Taylor, who became associated with the Bethlehem Iron Co. in May, 1898, for the purpose of introducing improved methods.

BETHLEHEM STEEL COMPANY, Department D. M., May 23, 1901

STATEMENT OF MACHINE TIME REQUIRED FOR ROUGH-TURNING FORGINGS.

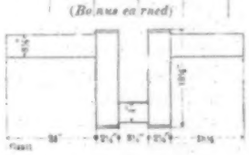
Description.	MACHINE TIME IN HOURS. Prior to 1898, when a beginning was made to introduce improved methods. Day Rate. No. 1.	Immediately before the introduction of the Bonus Plan for rewarding labor. Day Rate. No. 2.	Under the Bonus Plan. No. 3.
4-in. U. S. Navy Tubes	21.56	None machined	5.4
4 " " Jackets	35.15	"	7.1
6 " " Tubes	34.75	18.5	8.25
8 " " "	35.00	None machined	8.00
12 " " "	54.50	32.5	21.50
12 " " Jackets	123.70	65.5	43.33
12 " " A Hoops	No record.	80.75	34 50
12 " " B "	"	55.00	34.75
12 " " C "	"	47.50	34.50
12 " " D "	"	96.50	73.25
Ball & Wood Crank Shafts	"	46.5	26.25
Acme Cam Shafts	"	31.3	16.00
Clayton Double Throw Crank Shafts	"	22.3	4.3
Bement, Miles Piston Rods	"	13.00	3.2
S. Pacific Axles	"	4.25	1.5
C. R. R. of N. J. Driving Axles	"	6.5	1.5
Norfolk & Western Crank Pins	"	2.5	1.25
DeLa Vergne Piston Rods	"	22.0	5.0
Crank Shafts, N. Y. Shipbuilding Company	"	70.	28.75

CLASS OF WORK: *Lathe* | STANDING ORDER: *460* | ORDER NUMBER: *16837*

MACHINE NO.: *59* | TOOL: M E H | CLASS OF METAL: *14* | FORGING NUMBER: *28706 B 1 F 1*

MAN'S NAME ..... SPEED BOSS .....

	DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
	Change machine 60 minutes (for 1st one only)							
1	*Chuck for turning webs*					15		
2	*Turn webs*	*P R L*	*3 cuts*	*E*	*4 A F*	*1:40*		
3	*Change to Pin Centres*					10		
4	*Rough Pin to 4⅛ dia.*	*P S E*		*0.005*	*5 A F*	*2:10*		
5	*R face webs use double end tool*		*2 cuts*		*4 A F*	*1:40*		
6	*Finish " " " "*	"	*1 cut*	*H*	"	*40*		
7	*Finish turning pin & cut fillets*			*E*	*2 A F*	*2:00*		
8	*File pin round*					*1:10*		
9	*Polish pin*				*2 D F*	*40*		
10	*Inspect*					15		
11	*Remove crank*					05	*hr min*	
12	"					*10:50*	*10:50*	
13	*Pin in No. 1 finish ; webs are No. 3 finish*							
14								
15	*(Bonus earned)*							



Previous time 5½ hours

INSTRUCTION CARD NO.	SHEET DRAWING NO.	B. S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
4811	*F M C B*	*26194½ A*	*7*	*17*	*01*	*Buckley*

WHEN MACHINE CAN NOT BE RUN AS ORDERED SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP

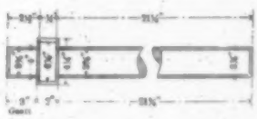
FIG. 3.

CLASS OF WORK: *Lathe* | STANDING ORDER: *570* | ORDER NUMBER: *17351*

MACHINE NO.: *160* | TOOL: M E H | CLASS OF METAL: *35* | FORGING NUMBER: *18958 B 1 F 1*

MAN'S NAME ..... SPEED BOSS .....

	DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
	Change machine 5 minutes (for 1st one only)							
1	*Chuck 5¼" to F P*					*5¼*		
2	*Turn 5¼" x 9¼" long*	*P R L*	*¼*	*6*	*2 B F*	*11*		
3	*Face end*	*P V M*			"	*05*		
4	*Turn end for rod*					*04*		
5	*Face end*	"			"	*05*		
6	*Turn 5¼" D&C*	*P R L*	*¼*	"	"	*09*		
7	*Turn 5¼" "*	"	*¼*	"	"	*09*		
8	*Remove piece*					*2½*		
9						*35*	*34 min.*	
10								
11								
12	*(Bonus earned)*							
13								
14								
15								



Previous time taken 1 hr. 6 min.

INSTRUCTION CARD NO.	SHEET DRAWING NO.	B. S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
5368		*6958*	*9*	*12*	*01*	*Buckley*

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

FIG. 4.

Increase in Output.

While the table just given is of interest, as showing in detail what has been accomplished, a more correct measure is afforded by the output of the shop. During the year from March 1, 1900, to March 1, 1901, the machine shop was run day and night as hard as the machines could be pushed by day work alone, and still the increasing output of the forge was piling up work ahead of it. It was at this juncture that the bonus system was put in operation, as stated in Mr. Snyder's report. To realize what happened in the few months after the introduction of the bonus, it is, perhaps, best to compare the shipments during those months with the average monthly shipments for the preceding year. I do not feel at liberty to give the actual shipments, but if we represent by unity the average monthly output of the shop during the year from

March 1, 1900, to March 1, 1901, the following figures will represent the output for the five months succeeding the introduction of the bonus system:

Average shipments per month for year from March 1, 1900, to March 1, 1901	1.00
Shipped in March, 1901	1.25
Shipped in April, 1901	1.53
Shipped in May, 1901	1.86
Shipped in June, 1901	1.98
Shipped in July, 1901	2.17

The bulk of the above shipments consisted of rough-machined forgings, and before the end of July the machine shop had caught up to the forge so closely that there was not enough work to keep all the machines running day and night, and a large number were shut down on the night turn. The output of the shop during August was far below that of July, for the reason that the forge did not furnish anything like work enough to keep it busy.

Although the results as above pointed out are very far in excess of what was anticipated, the writer does not feel that we have yet taken advantage of all our opportunities. As before stated, the system is one of education, with prizes for those who learn; but the prizes have so far been awarded for learning and doing only what our experts already knew. The next and most obvious step is to make it to the interest of the men to learn more than their cards can teach them. So far nothing has been done in this line, not because the need for some such provision has not been felt, but for the reason that no entirely satisfactory method has suggested itself.

The writer believes in paying a liberal compensation for improved methods of work, and in offering special inducements to a workman to make out instruction cards, by which others are enabled to carry out his methods. The compensation should be sufficiently liberal not only to induce him to part with what information he may have, but to use his ingenuity to devise better methods.

If this can be properly carried out, the most difficult problem of the system—that of training men to make out instruction cards—will have been solved, and the system will not only become self-perpetuating, but will automatically pick out the men best suited to carry it forward.

Discussion.

Dr. Robert H. Thurston characterized the paper as a most important contribution to the proceedings of the Society and said that the plan had an especial merit in its application and effect upon the present and future critical relationship of capital and labor.

F. A. Halsey did not wish to be ungracious in his treatment of a valuable paper, but in his estimation the method under discussion had been applied to a machine shop where the local conditions were most favorable and not comparable to those of the average plant. The material, for example, was manufactured by the same company and hence it was strictly uniform, and the known hardness permitted rules to be definitely settled for the cutting speeds, etc. The pieces were large and comparatively few in number, and the work mainly consisted in roughing cuts—a condition of affairs not common in the ordinary machine shop. It would probably be expected that he would compare the bonus system with the premium plan, and he took the opportunity of pointing out that while this latter plan may not be the best, and certainly is not perfect, it is a simple affair capable of being handled in the general class of machine shops.

C. H. Buckley, foreman at the Bethlehem shops before and after the introduction of the Gantt system, described the change in the working conditions. The new order of things had been difficult to handle at the outset. The preparation of the instruction cards had required the digestion of a mass of data; but with the employment of the specially designed slide rules now in use at the works the task in the hands of expert machinists was more a matter of routine, and the instruction cards were well worth any care in their preparation. The system was regarded with suspicion by the men at first, on account of the apparent impossibility of performing the operations in the specified time. Doubt in this direction could only be met by actually having the foreman undertake the work and finish it within the time limit. This broke down some of the opposition and the great financial inducement, comparatively speaking, led to the rapid and successful development of the plan after the settlement of the preliminary difficulties. He found that while the men had previously taken up considerable time in waiting for others, there was no hesitation now in an attempt to hurry the man who stood in their way, and less time was spent by the foreman in answering frivolous questions.

Fred W. Taylor entered into a careful discussion of the paper and laid considerable emphasis upon the value of what might be termed functional foremanship. He proposed the plan of having the work of supervising the men subdivided among several foremen in contradistinction to the usual method of alloting so many workmen to a foreman. For example, the speed foreman should have charge of the speeds and feeds adopted on the machines; the gang foreman to have in hand the preparation of the work to be done by the machinist; a suitable dog to be placed on the material and the necessary gauges, drawings, blueprints, and everything else in readiness for handling the work so that there will be no delay in taking hold of the new task. The inspector is another foreman responsible for the quality of the work turned out, and the time and cost man lays out the work for the shop in the order in which it is to be handled. The foreman in charge of the machinery has in hand the repair and maintenance of the equipment. The preparation of the instruction cards is the special business of another foreman. This subdivision of authority may cause an opportunity for some interference among the several men and a disciplinarian is appointed to take care of any misunderstanding between foremen and straightening out shop difficulties. Mr. Taylor held that functional or divided foremanship was absolutely necessary, owing to the increasing difficulty of obtaining good, all-around men for foremen. It was conducive to co-operative effort and no system of piece work could be a success unless it tends to prevent antagonism between the employer and the workmen. The laying out department is analogous to the drafting department. It may seem expensive but it is not so in reality as the laying out of the work must be done by somebody. Usually it is done in a hurry and not always by the best man for the task. The workman made his own plans as a general thing and these were often thought out at the commencement of the task and hence interfered with the work to some extent. Frequently the easier part of the work would be done first for this reason, irrespective of the possibility that the task might be performed much sooner by another method. As soon as the workman found that the instruction cards were practical productions, at least equal to any plan he could suggest, he gained confidence in the order of the operations laid down for his guidance and wasted no further time in the invention of other schemes. The fixing of an elementary piece rate was also a matter for serious experiment and care. The simplest operation requiring a very careful investigation before the several items could be fairly tabulated. The work of shoveling was given as an illustration of a task apparently simple, that had called for a minute investigation at the plant where the speaker was employed. The material, whether coke, coal or ore; whether taken from the base of the pile or from the surface; the distance and the height to which it is thrown; the average load that it is most economical to raise at each movement of the shovel, had been given minute attention. Incidentally he had found that the average shovelful should weigh 22 pounds to give the best results in actual work, and owing to the difference in the material shoveled his company now provided a distinctive size of shovel for each substance. A set of boilers under Mr. Taylor's charge some years ago had involved a cost of $60 for cleaning. This operation, owing to the character of the water used, was a somewhat costly tax, and an effort was made to reduce the expense. Mr. Taylor found it necessary, before any radical change could be made, to clean one of the boilers himself, and in spite of considerable ridicule he cleaned a boiler and plotted the actual cost for each plate, pipe and section in it. An instruction card was then prepared and the work systematized with the ultimate result of reducing the cost of cleaning the lot of boilers from $60 to $11. He had carried out the same thing with the handling of sulphide pulp digesters and found that the results were highly gratifying to employer and workman, the former lessening his expenses and the latter increasing his salary.

Mr. Gantt briefly closed the discussion by saying that the system was an educational one and as such was capable of greater value than any other with which he was acquainted.

THE FOUNDRYMEN'S ASSOCIATION.

The 113th meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia, on Wednesday, Dec. 4, the president, Thomas I. Rankin, occupying the chair. The following were present:

Thomas I. Rankin, Abram Cox Stove Co., Philadelphia.
Jas. S. Stirling, Harlan & Hollingsworth, Wilmington.
Thos. Devlin, Thos. Devlin & Co., Philadelphia.
P. D. Wanner, Reading Foundry Co., Reading, Pa.
J. H. Pepper, *The Iron Trade Review*, Philadelphia.
A. C. Mott, Abram Cox Stove Co., Philadelphia.
Thos. Green, Wilbraham-Green Blower Co., Philadelphia.
J. H. Julian, J. W. Paxson Co., Philadelphia.
L. R. Lemoine, U. S. Cast Iron Pipe & Foundry Co.
R. C. Oliphant, Trenton Mall. Iron Co., Trenton, N. J.
Thos. Hobson and A. A. Miller, *Iron Age*, Philadelphia.
H. B. Taylor, Pettinos Bros., Bethlehem, Pa.
Guyon Miller, Downingtown Mfg. Co., E. Downingtown.
W. J. W. Moore, Pilling & Crane, Philadelphia.
Jas. T. Strain, Robt. Wetherill & Co., Chester, Pa.
John T. Dickson, Chester, Pa.
C. H. Newcomb, Matthew Addy & Co., Philadelphia.
John Smith, Midvale Steel Co., Philadelphia.
J. Burns, Midvale Steel Co., Philadelphia.
S. Decatur Smith, Philadelphia.
H. O. Evans, Thos. Devlin & Co., Philadelphia.
George C. Davis, chemist, Philadelphia.
George C. Davies, Pilling & Crane, Philadelphia.
Jas. L. Knightley, Geo. V. Cresson Co., Philadelphia.
Oregon J. Ward, Howe Scale Co., Philadelphia.
C. D. Matthews, Camden Iron Works, Camden, N. J.
Paul C. Vanfleet, F. A. Sheppard & Co., Philadelphia.
Benjamin Booze, F. A. Sheppard & Co., Philadelphia.
D. G. Moore, Samuel L. Moore & Sons, Elizabethport, N. J.
A. J. Wright, Abram Cox Stove Co., Philadelphia.
Geo. W. Moore, Reading, Pa.
Walter S. Stevenson, Thomas Roberts, Stevenson Co., Philadelphia.
Howard Evans, J. W. Paxson Co., Philadelphia.

The first business taken up was the question of incorporation of the association under the laws of the State of Pennsylvania. After discussion of the details attending such a course, the matter was referred to the next meeting, P. D. Wanenr in the meantime offering to present the necessary information in regard to the procedure and cost, so that the association could act finally in the matter.

The treasurer, Josiah Thompson, reported a good balance in the treasury, and all bills paid.

In the invitation issued for the meeting a discussion was suggested as to the existing supply of loam and dry sand molders. In introducing the subject, Secretary Evans said that he had received a number of communications from founders in various sections, all tending to show that a good demand existed at the present time for good loam molders. The subject not being deemed one suitable for consideration by the association as a body, it was not discussed further

J. S. Stirling, as a member of the committee appointed to attend the reciprocity convention recently held in Washington, reported the attendance of the committee at such convention. In the course of his verbal report, he said: "I have no doubt you are all familiar with the results of the convention. There was a very full attendance, including representatives of commercial bodies from all parts of the country. The main object of the convention, in my opinion, was the gathering of the views of the different manufacturers and commercial organizations looking to the establishment of a department of commerce and industry upon the recommendation of Congress. The result of the convention was the passing of a resolution in favor of such a bureau. It was the opinion of all present at the convention that there should be no tinkering with the tariff. And yet it was brought out that there would probably come a time when the countries to which we are selling would close their doors to us, and it seemed to be a question whether it were not better to look the matter in the face and prepare to meet the situation. The protectionists were present at the convention in force, and from the resolutions passed it seemed they favored reciprocity where it did not conflict with any established domestic business."

Election of new members was next in order, and H. L. Haldeman, president of the Pulaski Iron Co., Philadelphia, was elected. Secretary Evans read a communication from the McKinley Memorial Association, soliciting the co-operation and active interest of the foundrymen in the national memorial to the late president which it was proposed to erect in Canton, O. After a short discussion, which pretty clearly showed the general desire of the members of the association to make a donaton to the memorial fund, a motion was passed donating the sum of $50 from the funds of the organization.

H. O. Evans then read a paper by J. G. Sadlier, of the Springfield Foundry Co., Springfield, O., on "Combustion and its Effect on the Structure of both Fuel and Metal." It appears elsewhere in this issue.

Discussion.

Mr. Wanner—The paper does not give very much information. Every man who runs a cupola should be, in a measure, very closely related to the cupola or the two cannot get along together

Mr. Moore, Elizabethport—I wish the gentleman who wrote the paper was here. We are told in such papers very generally what not to do, but we get no information as to what to do We all know we get hard iron and other troubles, but are not told how they can be remedied. In our own plant we have found much good resulting from the use of a blast gauge on a cupola, and we do not have as much trouble as we used to. It is necessary for the men around a cupola to be fully in touch with everything. If any man can formulate a rule whereby he can melt iron in any cupola he could make lots of money.

Mr. Wanner—Years ago, when I first became connected with the business, it was an ordinary thing to lose a heat now and then, but of late years we have not had such experiences. A mistake is made perhaps, now and then, and results are not always uniform, although perhaps not far away from the mark. Such a thing as dropping the bottom and losing a whole heat does not happen any more.

H. O. Evans—I think the writer of the paper makes the point that the air supply must be controlled. When the gauge on a cupola runs up to 22 it means a "blowing up" for the cupola man every time. I have always found that the higher the blast the higher the melting zone.

Mr. Moore—I have found some peculiar things in melting. We have one cupola on which is carried a pressure of 16 inches of water, and if that gets reduced we do not get good results. Now, we have another cupola on which we only carry 10 inches. The blower is driven by an independent engine and the speed can be regulated to carry the water in the gauge at any pressure that seems fit. The engineer ascertains which cupola is to be run and how much iron is to be melted and gets the pressure he considers proper for the melting.

Mr. Devlin—I do not see what the paper proves. I am a firm believer in chemistry and consider it very effective.

H. O. Evans—It would seem that all the points accounted for might come in the heat treatment of the iron.

After adjournment the usual lunch was served in the cafe of the club.

Good Furnace Record at a Steel Castsng Plant.

Open-hearth furnace No. 2 of the Solid Steel Casting Co., Chester, Pa., has just completed a remarkable run, making 450 consecutive heats without any stop for repairs. During this campaign some 12,250,000 pounds of steel castings were made. Considering the delays which are attendant on the operation of a furnace or a steel casting plant, this performance is phenomenal. The furnace is of Herrick design, 15 tons capacity, and is supplied with two improved gas producers.

The machine shops of the Bordo Co., Coatesville, Pa., together with the patents of the Bordo valve, were sold at sheriff's sale last week for $11,500 to James Greenwood, representing a syndicate that will operate the plant.

Officials of the New Haven Iron & Steel Co., New Haven, Conn., deny that they have sold their plant to the Susquehanna Iron & Steel Co. They state that no negotiations are pending for the sale of the plant. Recent additions make the daily capacity 110 tons.

NEW VERTICAL SPINDLE MILLING HEAD.

An illustration is given below, together with a detail section, of a new vertical spindle milling head for use on heavy knee type milling machines. The half-tone shows the head attached to a machine. The section which is on a vertical plane through the horizontal and vertical spindles, shows the construction and size.

The spindle is taper at its lower end where it runs in a babbitted bearing and is adjusted to this bearing by means of the lock nut on its upper end. The upper box is bronze, split and taper on its outside. It is adjusted to this end of the spindle by means of the lock nut on the box. This method of adjustment is the same as that used on the horizontal spindle of the machine.

The head can be swiveled in a vertical plane through 360 degrees. The circle bearing the graduation is divided into degrees and is 8⅝ inches in diameter, which is important in that it brings the graduations far apart. The manufacturers refer particularly to the method of securing cutter shanks in the spindle. The cutter shanks form the male part of a clutch, of which the spindle is the female. This takes the place of the usual tang on the end of shanks. In this case the ends of the shanks are tapped ⅝-inch-11, to fit the bolt shown, by which they are firmly secured. The bolt is provided with a shoulder near its head, so that it can be used for backing a shank out as well as for drawing it in.

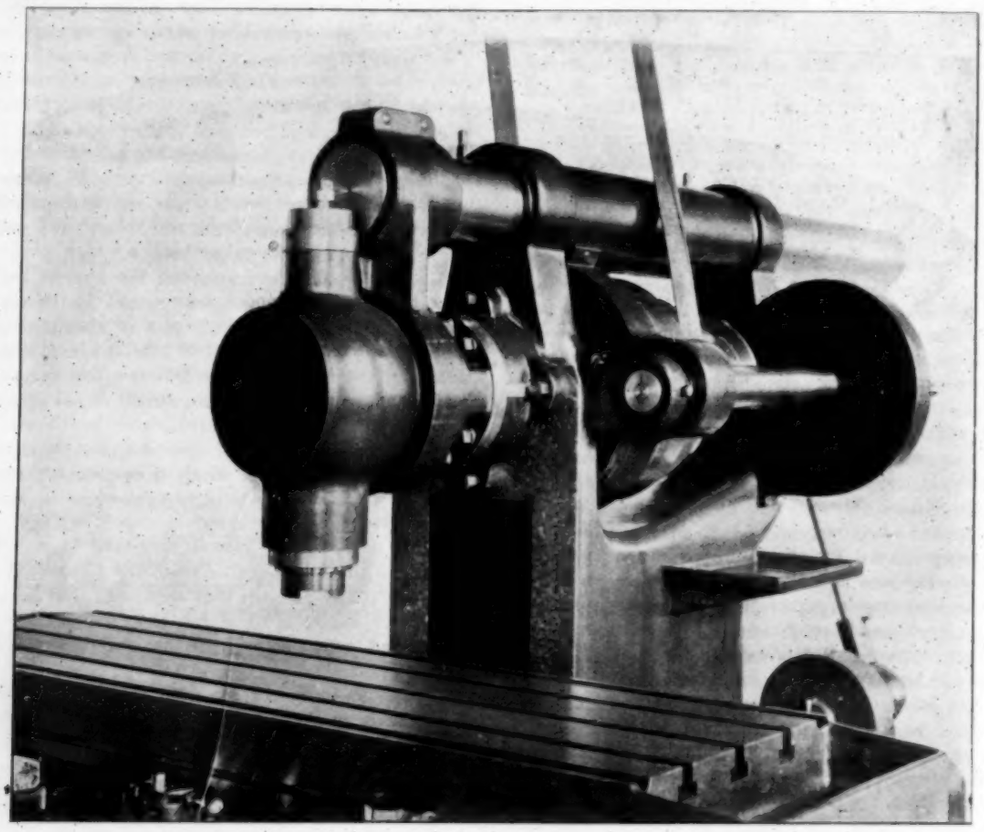


FIG. 1.—VERTICAL MILLING HEAD

The end of the spindle is threaded on the outside, as is the end of the horizontal spindle of the machine, and both spindles have the same size taper hole, so that all tools are interchangeable between the two spindles. With this attachment the horizontal spindle miller is readily converted into a vertical spindle miller, capable of doing heavy work. It will work a 6-inch diameter face mill in cast iron. When there is occasion to change cutters, while the work is chucked on the machine, the head can be swung at an angle, and the operator has all the room he wants for making the change. This obviates the awkward position which so often arises from a lack of room for changing cutters on the usual vertical spindle miller.

This attachment is made by the Cincinnati Milling Machine Co. and is especially designed for use on its No. 3 and No. 4 machines.

FOUNDRY LABOR TROUBLES IN 1901.

An interesting review of the important wage issues that have been made between the Iron Molders' Union and the National Founders' Association in 1901 appears in the *Iron Molders' Journal* for December. Other contests that have attracted attention in the year are also referred to. We make the following extracts

"As the year 1901 began, the utterances of men from all walks of life upon the subject of conciliation and arbitration in labor disputes, were still ringing in our ears as a result of the Chicago convention of the National Civic Federation. At the same time our own Cleveland strike was being fought with undiminished vigor. It had reached its seventh month with little apparent prospects of settlement. But little straws began to blow in a direction that indicated a mutual desire for adjustment, and after some preliminary correspondence between President Fox and President Hoyt of the N. F. A., a joint conference was held in Cleveland from Feb. 7 to Feb. 15, which resulted in an agreement under which the Detroit resolutions—the chief cause of the strike—ceased to be in operation in the Cleveland foundries, the foundrymen agreed to discharge all the non-union men within 40 days, and, as soon as a shop was rid of them, to fill it with union men, the wages to remain at the $2.75 rate. These were the salient features of the settlement.

"Within the specified time all the shops but three—Lorain Foundry Co., Otis Steel Co. and Variety Iron Works Co.—had complied with the terms of the agreement. These three shops have still failed to fulfil their manifest obligation, and are, therefore, closed to union men. The officers of the N. F. A. are emphatic in their expressions of disapproval of their course, but the prominence given to at least two of these recalcitrants at the late convention of the N. F. A., is such as to shake our faith in the sincerity of these protestations.

'On March 27 the annual conference was held with representatives of the Stove Founders' National Defense Association in Chicago, to consider their request of a reduction in molding prices and the ratio of apprentices. Agreement was reached by which the wage rate remained the same, and a

proposition looking to the change of our apprentice ratio from that of one apprentice to eight journeymen, to one apprentice to five journeymen, was to be submitted to a referendum vote of the membership. That vote is now being taken, and, whatever may be the result, the discussion which has been conducted upon this very important subject, should be of great educational value and assist us in establishing an equitable ratio of apprentices even though in doing so we run afoul of our prejudices.

"As spring advanced the wage rates in several localities began to demand attention. About the first in the field was No. 244, Detroit, with a demand for a $3 per day minimum for floor molders, then followed St. Louis, Chicago and Milwaukee with similar demands. As the Cleveland wage rate, by the terms of the February agreement, was to be considered early in June, a disposition was shown in other localities to postpone final action until a conference had pronounced upon the Cleveland case.

"Meanwhile, the strike of the machinists for the nine-hour workday was inaugurated on May 20. All over the country machine shops were temporarily deserted. Machinists, handy men and laborers took part in the movement, for

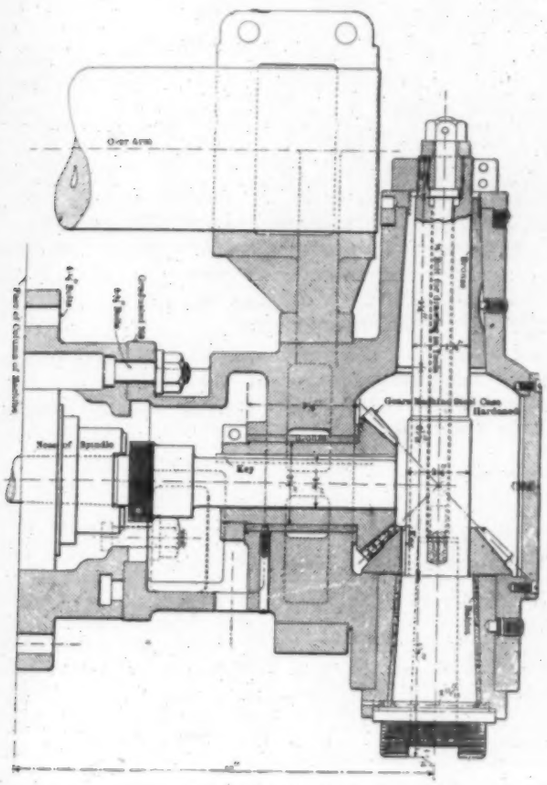


FIG. 2.—VERTICAL MILLING HEAD. VERTICAL SECTION.

a time paralyzing the industry. In a few places the molders, notably, on the Pacific Coast, also became involved, although warned against allowing themselves to be involved in a movement which depended upon enthusiasm to win against a powerful association of employers. When the June conference on the Cleveland wage rate was held the machinists' strike was at its height, and, though Cleveland machine shops were not involved to any great extent, the foundry industry in so many localities was injuriously affected, the outlook was so uncertain because of further threatened complications with the steel workers, that no decision was reached upon the demand of No. 218 for an advance of 25 cents per day, and under the circumstances the board did not deem it advisable to force the issue.

"The situation, it will thus be seen, was a critical one. The Chicago molders who had demanded an advance of 25 cents per day in the minimum of floor molders and 50 cents per day for bench molders, thus establishing a straight minimum of $3 per day, had refused a compromise of $2.75 per day for bench and floor molders made by the Chicago foundrymen, and were urgent in the desire that they be permitted to strike for their original demands. Other localities were equally urgent, the immediate future of trade conditions was shrouded in uncertainty because of the complications above referred to, and the fact that in many localities our members were either idle or on short time because of them. It was, therefore, decided to call a meeting of the executive board at which representatives of the disturbed localities should be present to confer. The meeting was held on June 24, and it was decided to take up the Chicago case first. On July 1 and 2 the conference with representatives of the N. F. A. was held and adjourned with two propositions of the representatives of the union pending. These were subsequently rejected, and an offer of $2.85 minimum to floor molders and $2.65 to bench molders was made, with the understanding that the same advance would be given in the other centers where wage demands were pending. The board had already pronounced themselves as in favor of devoting attention to the low-priced districts, which were a constant menace to the wages of the better organized centers, and thus fortifying the position of the latter rather than of pursuing a policy which might involve the organization in a strike that would monopolize its resources for a time, in order to secure a further advance for a large center, if a reasonable compromise could be peacefully effected. Consistent with this policy and with due appreciation of the situation as herein outlined, the board instructed the national officers to accept the foundrymen's proposition. The Chicago conference board had served notice that unless the executive board agreed to support them in their demands they would strike independently. It was thought calmer judgment and a realization of the situation would prevent such extreme measures, but this proved incorrect, and on July 5 the Chicago strike was inaugurated, the members of No. 153, Harvey, Ill., one of the locals in the Chicago conference board, refusing to take part and accepting the executive board's decision.

"This is in brief what preceded the Chicago strike. Fortunately for our members the machinists' strike collapsed towards the beginning of August and trade immediately began to pick up all over the country. A good measure of success has attended their efforts. They put up a good fight, but according to advices from Chicago there yet remain about 20 shops that are resisting their efforts. In the final computation we still feel that obedience to the decision of the executive board will again be demonstrated as being the wisest policy in such an emergency.

"The Eastern districts of Pennsylvania have long been known to the machinery branch of the trade as low-wage districts. From the New York and Philadelphia districts, where a higher wage rate has been maintained, constant complaints have been heard about competition with the large number of small foundry towns which dot Eastern Pennsylvania. York, Pa., where No. 33 holds sway, is recognized as the center of this community, and there it was determined to make an effort to establish some kind of minimum. Accordingly a demand for $2.25 per day was made. Four shops became involved, and since early in May the fight has been continued. The foundrymen of York are not members of the N. F. A., so that they could not be reached through that association and a strike was the only recourse. The machinists were also involved at the beginning of the fight, but they soon dropped out and returned to work. The employers thus encouraged renewed their efforts to defeat our members, but finding them staunch and determined, finally invoked the aid of the law and secured from Judge Stewart one of the most sweeping injunctions of the year. For violating some of its terms Bros. Frey, fourth vice-president, and Test, corresponding representative of No. 33, were thrown into jail after a farcical trial, and only liberated upon payment of a heavy fine on their behalf by the I. M. U. This demonstration, however, failed of its purpose, and the molders are fighting yet. Although the original purpose of this struggle is not yet attained, its moral effect in the district has been most marked and wages have sensibly advanced and conditions been bettered. The result of a strike cannot always be computed by its effect in the locality immediately affected.

"On July 22 a conference of representatives of the metal trades met in St. Louis, Mo., and formulated articles to gov-

ern a proposed federation of the unions of these trades as a means of offsetting the powerful associations of employers, which were making their influence felt in the regulation of wages and conditions. Representatives of the trades interested will meet at Scranton, Pa., during the A. F. of L. convention to give the project further consideration.

"Altogether the year has been a very successful one for the Iron Molders' Union. The general trade activity has been reflected in its progress during the year. Let us hope it has built to endure."

MELTING LOSS IN THE FOUNDRY CUPOLA.

Secretary Richard Moldenke, of the American Foundrymen's Association has published in the Journal of the association the results of his recent inquiry into the melting loss incident to foundry cupola operations. He says:

It will be remembered that the following information was asked for: The class of work and usual tonnage. Time from "blast on" to "drop bottom," with blast pressure from fan

TABLE I.—GENERAL JOBBING.

	NUMBERS.				
	1	2	3	4	5
Usual Tonnage	10	3	3	3	20
Time of Melting: hs., ms.	1' 15"	1' 00"	1' 15"	2' 0"	
Blast pressure, oz.	8			8	8
Fan or Blower	F	F	F	B	F
Pig Iron	Coke	Coke	Coke	Coke	
% Southern	None		None	None	
Fuel used	Coke	Coke	Coke	Coke	
Scrap bought	Mach.	Med. Mch	Mach.	Stove	Mach.
Pig Iron used, lbs	10,400	3,200	2,657	2,885	20,000
Scrap used	9,600	3,200	2,886	3,885	20,000
Castings made	16,000	5,504	3,916	4,057	35,200
Scrap made	1,352	620	872	1,873	2,200
% Melting loss	10.7	4.3	13.6	9.7	6.5

NOTE.—No. 3 is average of 10 heats.

or blower. The kind of fuel used, also pig iron, whether charcoal or coke, and the percentage of Southern brands. The kind of scrap bought. Then the weights of pig iron and scrap charged, and castings and scrap made. The last named items were necessary to figure the melting losses, and the other material to interpret the results intelligently. The

TABLE II.—LIGHT JOBBING.

	NUMBERS.			
	6	7	8	9
Usual Tonnage	72	6	16	2.5
Time or Melting: hrs., mins.	3' 30"	1' 30"	2' 30"	1' 00"
Blast pressure, oz.	13	5.5		
Fan or Blower	B	F	F	F
Pig Iron	Coke	Coke	Coke	Coke
% Southern	None		None	None
Fuel used	Coke	Coke & Coal	Coke	Coke
Scrap bought		Stove	Lt. Mach.	Med. Mach.
Pig Iron used, lbs.	102,000	4,500	19,200	3,200
Scrap used	42,600	7,500	12,800	1,800
Castings made	108,300	10,300	21,000	4,000
Scrap made	27,500	1,200	9,100	800
% Melting loss	5.7	2.4	6.0	4.0

name of the foundries sending this information was to be kept confidential, and our secretary hereby conveys the thanks of the association to its friends for their courtesy, and states that after the tables annexed were constructed the memoranda sent in were destroyed.

Of the many replies, which came even from Europe, only

TABLE III.—LIGHT MACHINERY.

	NUMBERS.					
	10	11	12	13	14	15
Usual Tonnage.	10	6	3.5	5	15	40
Time M'lt, h.m.	1' 10"	2' 0"	1' 30"	1' 30"	2' 00"	6' 40"
Blast pres., oz.			7	5	7	
Fan or Blower	F	F	B	F	B	F
Pig Iron	Coke	C'k & C'l	Coke	Coke	Coke	Coke
% Southern			None	50	35	50
Fuel used	C'k & C'l	Coke	Coke	C'k & C'l	Coke	Coke
Scrap bought	None	Med M'ch	L't Mach	Med M'ch	Lt. Mch	Stove
P. iron used, lbs	16,000	6,000	3,900	4,500	14,000	56,000
Scrap used	4,000	6,000	2,750	4,280	16,000	24,000
Castings made	13,220	10,000	3,738	7,640	20,500	60,000
Scrap made	4,520	900	2,762	800	6,000	16,000
% Melting loss	6.5	9.2	2.3	3.9	11.6	5.0

41 could be used, as the information was not definite enough; others again had their material from the cupola equal to that going in, which manifestly indicates overzealousness on the part of the weighers. Only the best records seem to have been sent in, as surprisingly low losses are to be chronicled in many cases. Nevertheless, apart from possible errors in weighing, the records are certainly valuable, as it is perfectly possible to melt clean iron and scrap with melting losses running below 5 per cent. In fact, your secretary has individual knowledge of one of the heaviest producers of car wheels in the country, taking their stock books all the year round, where the actual melting loss is less than 2 per cent. Here we see the value of clean, unoxidised irons, scrap which is not rusty, and a well constructed cupola in good working order. The information received was tabulated in such a way that the interested founder can turn at once to the results he wants most.

TABLE IV.—HEAVY MACHINERY.

	NUMBERS.			
	16	17	18	19
Usual Tonnage	13	15	21	15
Time of Melt., hrs. min.	2' 0"	2' 0"	4' 00"	2' 00"
Blast Pressure, oz	6	10	9	14
Fan or Blower	B	B	B	B
Pig Iron	Coke	Coke	C'k & Ch	Coke
% Southern	50	70	17	20
Fuel used	Coke	Coke	Coke	Coke
Scrap bought	Mach.	Hvy. Mach.	Mach.	
Pig iron used. lbs	14,720	20,000	25,740	15,500
Scrap used	11,130	10,000	16,270	11,500
Castings made	18,845	21,300	32,760	19,000
Scrap made	4,870	7,200	7,560	6,000
% Melting loss	8.4	5.0	4.0	7.4

TABLE V.—STOVE PLATE.

	NUMBERS.		
	20	21	22
Usual Tonnage	20	15	10
Time of Melt., hrs. min.	2' 15"	1' 30"	
Blast Pressure, oz.	14	11	13
Fan or Blower	B		B
Pig Iron	Coke	Coke	Coke
% Southern	100	50	25
Fuel used	C'k. & C'l.	Coke	C'k. & C'l.
Scrap bought	Stove	Stove	
Pig iron used, lbs.	20,000	18,000	11,863
Scrap used	20,000	12,000	7,906
Castings made	24,000	29,192	11,750
Scrap made	14,200	9,000	7,629
% Melting loss	4.5	2.7	2.0

Note—No. 22 is average of 5 heats.

TABLE VII—AGRICULTURAL.

	NUMBERS.				
	31	32	33	34	35
Usual Tonnage	80	45	41	9	9.5
Time of Heat, hrs. min.	4' 20"	3' 15"	3' 30"	2' 00"	1' 20"
Blast Pressure, oz.	16	12	13	12	9
Fan or Blower	B	B	B	B	B
Pig Iron	Coke	Coke	Coke	Coke	Coke
% Southern	50		50	50	None
Fuel used	Coke	Coke	Coke	C'k & C'l	C'k & C'l
Scrap bought	Agr No. 1	Agr No. 1	Med M'ch	Stove	Stove
Pig iron used, lbs.	80,000	45,000	45,700	7,071	7,500
Scrap used	80,000	45,000	35,800	10,674	11,600
Castings made	108,800	61,200	62,960	11,845	7,450
Scrap made	42,700	24,300	15,600	5,200	10,650
% Melting loss	5.3	5.0	3.6	4.0	5.3

Nos. 2 and 3 seem to represent the extremes in this table, and strange to say, in each case about half pig and half scrap is in the mixture. It is possible that the diameter of

TABLE VIII—RAILROAD CASTINGS.

	NUMBERS.		
	36	37	38
Usual Tonnage	47	32	6.5
Time of Heat, hrs. min.	5' 20"	3' 45"	2' 00"
Blast Pressure, oz.	16	4	9
Fan or Blower	B	F	
Pig Iron	Coke	Ch. & Coke	Coke
% Southern		60	None
Fuel used	Coke	Coke & Coal	Coke
Scrap bought	None	None	
Pig iron used, lbs	66,500	25,000	6,765
Scrap used	28,500	39,000	6,235
Castings made	60,400	54,000	10,000
Scrap made	28,700	7,500	2,385
% Melting loss	6.1	3.9	4.7

Note—No. 37 is average of 27 heats. No. 38 is average of 25 heats.

the cupola may give a clue to the great difference, or yet the scrap in No. 3 may be very dirty. The table is a good representation of the general jobbing trade, a small, medium, and heavy tonnage being shown.

No. 6 is an example of heavy tonnage, and No. 9, on the other hand, of a very light one. The results are all good.

In table 3 we have a record of Southern iron used. The

point was raised by one foundryman that whenever he used Southern irons the melting loss was increased by about one per cent. Nos. 13 and 15 do not seem to bear this out,

TABLE IX—FLOOR PLATES, GRATE BARS, ETC.

	NUMBERS.	
	39	40
Usual Tonnage	30	3
Time of Heat, hrs. min	3' 40"	1' 00"
Blast Pressure, oz	16	
Fan or Blower	B	F
Pig Iron	Coke	Coke
% Southern	None	
Fuel used	Coke	Coke & Coal
Scrap bought	Medium Machine	Light Machine
Pig iron used, lbs	20,000	None
Scrap used	40,000	6,000
Castings made	47,400	5,100
Scrap made	8,200	525
% Melting loss	7.3	6.2

and very probably the experience above mentioned may be traced to the use of Southern irons high in silicon. These would offer plenty of material to burn out. Possibly No. 14

TABLE X—CAR WHEEL.

	NUMBER.
	41
Usual Tonnage	200
Time of Heat, hrs. min	7' 0"
Blast Pressure, oz	10
Fan or Blower	B
Scrap bought	Wheel
% Melting loss	2.1

is an example of this kind. Where coke and coal are given as the fuels used, the practice varies from an anthracite bed with subsequent charges of coke, to practically all anthracite, or

TABLE VI.—SANITARY WARE.

	NUMBERS.							
	23	24	25	26	27	28	29	30
Usual Tonnage	12	22	38	16	25	26	40	23
Time of Heat, hrs. min	2' 00"	3' 15"	3' 15"	2' 30"	3' 45"	3' 45"	3' 45"	3' 00"
Blast Pressure, oz	5	14	14	5	14		5	
Fan or Blower	F	B	B	F	B	B	F	B
Pig Iron	Coke	Coke	Coke	Coke	Coke	Coke	Coke	Coke
% Southern	None		60				None	
Fuel used	Coke & Coal.	Coke	Coke	Coke & Coal	Coke	Coke	C'k. & Coal	Coke
Scrap bought	Medium		None	Med. Mach	None		Medium	None
Pig iron used, lbs	11,800	51,000	56,000	9,875	31,470	33,000	35,500	29,000
Scrap used	12,200	12,000	20,000	22,625	17,760	19,850	47,210	17,500
Casting made	17,228	46,660	51,614	23,276	35,956	37,250	59,400	33,385
Scrap made	6,048	12,234	18,386	8,056	11,270	11,300	21,960	11,500
% Melting loss	3.0	6.5	7.9	3.6	4.1	3.0	1.7	3.5

at least only enough coke to effect a noticeable separation of the successive charges. Now and then we find charcoal irons on the list. It may also be observed that the positive blower is very much in evidence, and that the blast pressures run quite high. As the tables really explain themselves, they follow without further comment.

In the Birmingham, Ala., district a number of furnaces are being prepared for early resumption. The new furnace of the Republic Iron & Steel Co., at its Thomas plant, will be blown in shortly, while No. 4 furnace, of the Sloss-Sheffield Steel & Iron Co., at North Birmingham, was blown in last week. The North Alabama Iron & Coal Co. will blow in its furnace at Talladega the latter part of this month, while the furnace of the Woodward Iron Co. will be in blast before the first of the year.

The Globe Machine & Stamping Co., of Cleveland, manufacturer of machine shop special tools and dies, stamped metal work, hardware specialties and small machinery, has removed their shops to 970 and 972 Hamilton street, Cleveland, where it has treble its former floor space. The company has bought a 36 x 36-inch x 8-ft. Cincinnati planer and a Draper lathe, to enable it to fill a contract for special machinery. It is constantly getting orders for heavier work and is contemplating the purchase of additional machine tools to take care of these orders.

The addition to the Brylgon Foundry Co.'s plant, near Reading, Pa., has been completed. An addition to the office building will also be erected shortly.

The American Society of Mechanical Engineers.

The 44th meeting of the American Society of Mechanical Engineers was held at the house of the society, 12 West 31st street New York, from Tuesday, Dec. 3, to Friday, Dec. 6, inclusive. At the opening session, held on the evening of Dec. 3, the president, Samuel T. Wellman, of Cleveland, submitted an address on "The Early History of Open-Hearth Steel Manufacture in the United States." This paper was published in our issue of last week. Among the members present were the following:

Members in Attendance.

Samuel T. Wellman, Cleveland; Wm. H. Wiley, New York; F. R. Hutton, New York; A. L. Rice, New York; Francis W. Hoadley, New York; Edwin Reynolds, Milwaukee, Wis.; Charles H. Loring, Brooklyn, N. Y.; Charles Wallace Hunt, New York; Stevenson Taylor, New York; Stephen W. Baldwin, New York; Arthur M. Waitt, New York; Henry A. Bang, New York; F. E. Idell, New York; D. S. Jacobus, Hoboken, N. J.; Chas. M. Wales, New York; H. de B. Parsons, New York; Geo. N. Van Derhoef, New York; Carleton W. Nason, New York; H. H. Suplee, New York; H. W. York, New York; Jesse M. Smith, New York; R. H. Soule, New York; Wm. F. Monaghan, New York; Albert A. Cary, New York; Albert Spies, New York; E. D. Meier, New York; David H. Darrin, New York; C. E. Giles, Providence, R. I.; W. R. Warner, Cleveland, O.; A. G. Heggem, Massillon, O.; J. D. Cox, Cleveland, O.; Eph. Smith, Boston, Mass.; J. K. Wright, New York; William R. King, New York; Chas. W. Barnaby, New York; F. H. Richards, Hartford, Conn.; R. S. Hale, Boston, Mass.; C. H. Benjamin, Cleveland, O.; F. M. Rites, Ithaca, N. Y.; Jos. L. Gobeille, Cleveland; F. H. Childs, Ambrose Swasey, Cleveland; Wm. T. Bonner, New York; Chas. F. Foster, Chicago; Horace B. Gale, Natick, Mass.; W. M. McFarland, Pittsburg, Pa.; E. E. Wood, Springfield, Vt.; Chas. L. Bauer, Springfield, O.; Theo. A. Bruegel, Philadelphia; Chas. E. Billings, Hartford, Conn.; Aug. A. Honsberg, Cleveland, O.; H. M. Norris, Cincinnati, O.; J. W. Paul, Kittanning, Pa.; J. Leland Wells, New York; Anthony Victorin, Washington, D. C.; Richard H. Sears, Cleveland; Clark Fisher, Trenton, N. J.; A. H. Sabin, New York; T. W. Ridsdale, New York; F. H. Stillman, New York; A. R. Gillis, Syracuse, N. Y.; R. H. Fernald, New York; Geo. H. Scott, Worcester, Mass.; J. O. Nixon, Philadelphia, Pa.; J. Welch Lowell, New York; Daniel Ashworth, Pittsburg, Pa.; Chas. A. G. Winther, Indian Orchard, Mass.; E. S. Boyer, New York; Louis Cassier, New York; A. W. Colwell, New York; Thos. C. Perkins, New York; Chas. H. Morgan, Worcester, Mass.; E. R. Archer, Richmond; John C. Kafer, New York; Chas. H. Manning, Manchester, N. H.; T. H. Muller, New York; Harris Tabor, Elizabeth, N. J.; John A. Brashear, Allegheny City, Pa.; W. E. Schoenborn, Washington, D. C.; S. D. Tompkins, Jersey City; C. W. Boyer, Somerville, Mass.; David, Townsend, Philadelphia, Pa.; Robert McArthur, Biddeford, Maine; A. H. Raynal, Washington, D. C.; F. L. Emory, Morgantown, W. Va.; C. C. King, New York; Wm. H. McKiever, New York; Henry I. Snell, Philadelphia, Pa.; Geo. H. Barrus, Boston, Mass.; J. M. B. Scheele, Albany, N. Y.; Geo. W. Weeks, Clinton, Mass.; W. S. Rogers, Keene, N. H.; John W. Hill, Keene, N. H.; Henry C. Meyer Jr., Montclair, N.

J.; Francis H. Boyer, Somerville, Mass.; A. C. Ashton, Boston, Mass.; DeCourcy May, Philadelphia, Pa.; Wm. Garrett, Cleveland, O.; P. J. Fickinger, Conneaut, O.; Jos. J. Butcher, Thompsonville, Conn.; Ralph Crooker Jr., Elyria, O.; Ernest W. Naylor, Philadelphia, Pa.; Chas. E. Lucke, guest of R. H. Fernald; Chas. M. Allen, Worcester, Mass.; F. W. Parsons, Tarrytown, N. Y.; E. J. Armstrong, Erie, Pa.; D. W. Robb, Amherst, N. S.; Chas. C. Tyler, Pittsburg, Pa.; Thos. F. Flinn, Brooklyn; Howard L. Coburn, New York; A. Parker Smith, New York; W. M. Dollar, Buffalo, N. Y.; F. A. Halsey, New York; J. Rowley George, Worcester, Mass.; C. J. H. Woodbury, Lynn, Mass.; E. E. Olcott, New York; F A. Scheffler, New York; V. H. Rood, Jeanesville, Pa.; G. M. Basford, New York; W. H. Francis, Philadelphia; Samuel M. Green, Holyoke, Mass.; John E. Sweet, Syracuse, N. Y.; T. F. Burgdorff New York; C. A. Read, Durham, N. H.; A. W. Cash, Newark, N. J.; Chas. H. Corbett, Brooklyn, N. Y.; Robert York, Pine Bluff, Ark.; W. M. Mackay, New York; Wm. J. Baldwin, New York; L. R. Pomeroy, East Orange, N. J.; W. E. Lake, New York; Frank G. Brown, Troy, N. Y.; Otto Fleischman, Boston, Mass.; John S. Klein, Oil City, Pa.; F. Meriam Wheeler, New York; Robert Allison, Port Carbon, Pa.; J. Fred. Wilson, Worcester, Mass.; W. F. Burdett, New York; Fred'k C. Fladd, Brooklyn; Frank E. Holt, Jersey City, N. J.; D. J. Lewis Jr., South Orange, N. J.; L. A. Alexander, Ansonia, Conn.; Chas. W. Thomas, Franklin, N. J.; Oliver S. Shantz, New York; George Dinkel, Jersey City; E. P. Bates, Syracuse, N. Y.; T. R. Almond, Brooklyn; H. E. Smith, Brooklyn; H. G. Hammett, Troy, N. Y.; A. O. Van Dervort, Troy, N. Y.; Geo. R. Fulton, Brooklyn; J. S. Lane, New York; Geo. I. Rockwood, Worcester, Mass.; Chas. E. Ross, New York; Levi R. Green, Boston, Mass.; E. K. Conover, New York; O. C. Woolson, New York; F. H. Colvin, New York; Fred. J. Miller, New York; Angus Sinclair, New York; A. L. Cheney, Newark, N. J.; James McBride, Brooklyn; E. H. Parks, Providence, R. I.; Geo. E. Whitehead, Providence, R. I.;Francis G. Hall, New York; Walter D. Steele, New York; C. W. Rice, New York; G. R. Brandon, Chicago; F. H. Burton, E. Orange, N. J.; Theodore N. Case, New York; A. M. Feldman, New York; H. L. Aldrich, New York; I. C. G. Wilkin, New York; O. P. Cummings, New York; S. H. Libby, East Orange, N. J.; Arthur Herschmann, New York; A. W. Jacobi, Newark, N. J.; G. R. Cullingworth, New York; B. F. Stangland, New York; Geo. M. Peck, New York; W. Wallace Christie, Paterson, N. J.; W. E. Farrell, Birdsboro, Pa.; John J. Hoppes, Springfield, O.; Chas. E. Hoppes, Springfield, O.; D. S. Kohler, Columbus, O.; Gaetano Lanza, Boston, Mass.; Harrington Emerson, Philadelphia, Pa.; John Willett, guest of O. P. Cummings; Elmer H. Neff, New York; Charles P. Pollak, New York; Charles Ekstrand, Brooklyn; J. A. Connell, New York; George H. Merril, George L. Fowler, New York; V. J. Goetz, New York; A. J. Pitkin, Schenectady, N. Y.; S. H. Pitkin, Akron, O.; D. A. Mason, New York; V. Bartholini, Charles B. Rowland, New York; L. S. Louer, New York; W. H. Boehm, New York; Wm. J. Rielly, Cleveland, O.; Wm. F. Burleigh, Newark, N. J.; A. D. Pentz, New York; W. R. Webster, Philadelphia, Pa.; Maunsel White, Bethlehem, Pa.; Louis R. Alberger, New York; William Kent, Passaic, N. J.; Seaton M. Scott, Brooklyn, N. Y.; E. S. Farwell, New York; Harry Alexander, New York; F. M. Hitchcock, New York; A. W. Patterson Jr., Tarrytown, N. Y.; Chas. W. Pusey, Wilmington, Del.; Jas. M. Cremer, Brooklyn, N. Y.; Arthur C. Walworth, Boston, Mass.; Kenneth Torrance, Brooklyn, N. Y.; Jos. C. Schaeffler, Boston, Mass.; M. P. Higgins, Worcester, Mass.; Geo. A. Tibbals, Brooklyn, N. Y.; W. J. Kaup, Brooklyn, N. Y.; D. T. McLeod, New York; J. L. Hagy, Philadelphia, Pa.; Wm. Gleason, Rochester, N. Y.; E. H. McClintock, Keene, N. H.; Carl L. Grohmann, New York; John Hulett, Pittston, Pa.; W. Kelsey, New York; C. B. Rearick, New York; Giles Beach, Gloversville, N. Y.; E. G. Tremaine, Brooklyn, N. Y.; T. R. Morgan, Cleveland, O.; A. C. Pinkey, C. H. Wellman, Cleveland, O.; John T. Horton, Brooklyn; Edward P. Thompson, New York; John M. Robinson, New York; W. B. Mayo, New York; Frank Richards, New York; Gus C. Henning, New York; H. P. Quick, Boston, Mass.; Arthur L. Williston, Brooklyn, N. Y.; James M. Dodge, Philadelphia, Pa.; W. A. Pearson, Schenectady, N. Y.; Will J. Sando, New York; Robt. H. Thurston, Ithaca, N. Y.; L. R. Hopton, New York; John D. Logan, Brooklyn, N. Y.; F. P. Sheldon, Providence, R. I.; A. N. Sheldon, Providence, R. I.; E. H. Sedgwick, Elizabeth, N. J.; Darwin Almy, Providence, R. I.; John H. Barr, Ithaca, N. Y.; Edwin D. Tucker, New York; P. T. Bates, New York; W. P. Bettendorf, Davenport, Ia.; F. V. Henshaw, New York; Alfred Brooks Fry, New York; W. R. Wilson, New York; R. L. Warner, Boston; James G. Winship, New York; Philip A. Lange, Pittsburg, Pa.; R. H. Rice, Providence, R. I.; J. Stewart Thomson, Jersey City; F. Lindmark, guest of J. S. Thomson; H. F. J. Porter, New York; C. Kirchhoff, New York; A. Rusbatch, Cleveland, O.; E. P. Sparrow, Malden, Mass.; Henry Torrance, New York; Henry G. Morris, Philadelphia, Pa.; A. P. Boller Jr., New York; C. S. Hollaway Honolulu, H. I.; F. J. Wood, Brookyn; A. Smith, Harvey E. Mole, New York; N. C. Butler, Brooklyn; H. B. Roelker, New York.; J. A. Capp, Schenectady, N. Y.; H. W. Spangler, Philadelphia, Pa.; F. R. Low, New York; C. G. Atwater, New York; W. B. Jackson, Pittsfield, Mass.; Frank Mossberg, Attleboro, Mass.; J. V. Hamilton, Brooklyn, N. Y.; George Fred'k Higgins, Worcester, Mass.; H. H. Morrison, New York; Wm. G. Shepherd, Seneca Falls, N. Y.; John B. Mayo, Torrington, Conn.; W. H. Blauvelt, Syracuse, N. Y.; J. W. Lane Jr., New York; M. M. Upson, New York; T. Allen Hilles, Delaware, H. W. Wyman, Worcester, Mass.; H. F. Frevert, New York; James B. Ladd, Philadelphia, Pa.; H. W. Webster, New York; Robert W. Hunt, Chicago, Ill.; Wm. Schwanhausser, Brooklyn, N. Y.; Q. N. Evans, Brooklyn, N. Y.; H. M. Lane, Scranton, Pa.; Wm. Prellwitz, Easton, Pa.; C. I. Earll, New York; A. P. Trautwein, Carbondale, Pa.; H. V. Conrad, New York; H. F. Glenn, Berwick, Pa.; John Fritz, Bethlehem, Pa.; Henry M. Howe, New York; Chas. Baker, Whiting, N. Y.; H. G. Torrey, New York; J. W. Lieb Jr., New York; Thos. E. Murray, New York; F. H. Laforge, Waterbury, Conn.; F. W. Dean, Boston, Mass.; Geo. M. Bond, Hartford, Conn.; W. F. M. Goss, Lafayette, Ind.; Chas. Batchelor, New York; Albert L. Colby, So. Bethlehem, Pa.; D. L. Hough, New York; Wm. H. Gerrish, Paterson, N. J.; E. M. Herr, Pittsburg, Pa.; E. H. Foster, New York; A. C. Christensen, New York; Henry R. Towne, New York; Wm. R. Roney, New York; Arthur E. Johnson, Washington, D. C.; W. S. Huson, Derby, Conn.; E. W. Johnson, Waterbury, Conn.; Wm. C. Coffin, Pittsburg, Pa.; H. A. Carpenter, Sewickley, Pa.; F. Martens, College Point, N. Y.; John H. Norris, Brooklyn, N. Y.; E. C. Barth, Newark, N. J.; Wm. Roberts, Waltham, Mass.; Horace See, New York; H. F. Abrams, New York; G. H. Lilley, New York; Wm. L. Neff; guest of E. H. Neff; H. G. Rust, Schenectady, N. Y.; Horace K. Jones, Hartford, Conn.; Geo. S. Morison, New York; Walter C. Kerr, New York; Frank J. Plummer, Norwich, Conn.; D. N. Melvin, Staten Island, N. Y.; Geo. R. Stetson, New Bedford, Mass.; John Dick, Meadville, Pa.; Geo. H. Waters, Jersey City, N. J.; Amory E. Rowland, New Haven, Conn.; John Platt, New York; Ira H. Woolson, New York; F. F. Nickel, Brooklyn; Henry P. Merriam, New York; Wm. A. Lorenz, Hartford, Conn.; E. D. Church Jr., New York; John P. Bland, Philadelphia, Pa.; John L. Gill Jr., Philadelphia, Pa.; John P. Sparrow, New York; John Loyd, New York; J. R. Mattack, Harrisburg, Pa.; W. H. Odell, Yonkers, N. Y.; F. Ruel Baldwin, New York; E. R. Fellows, Springfield, Vt.; John W. Loveland, New York; Daniel E. Moran, New York; J. E. Wilson, Bridgeport, Conn.; Geo. S. Barnum, New Haven, Conn.; A. Riesenberger, Hoboken, N. J.; W. H. Bristol, Hoboken, N. J.; B. P. Flint, New York; Leslie Moulthrop, New Haven, Conn.; W. B. Bogardus, Cleveland, O.; H. A. Burnham, Passaic, N. J.; Edw. N. Trump, Syracuse, N. Y.; W. H. Bradley, New York; Hobart Canfield, Morristown, N. J.; Warren E. Hill, Brooklyn, N. Y.; W. M. Taylor, Indianapolis, Ind.; W. V. Gould, Mt. Vernon, N. Y.; R. G. G. Moldenke, New York; D. N. McBrier, Erie, Pa.; Spencer, Otis, Chicago, Ill.; Otto H. Klein, New York; Henry W. Bulkley,

New York; A. Aller, New York; Chas. R. Pratt, Montclair, N. J.; James Owen, Newark, N. J.; E. H. Peabody, New York; Paul H. Grimm, Glen Cove, N. Y.; M. W. Sewall, Roselle, N. J.; W. D. Forbes, Hoboken, N. J.; Oluf Tyberg, New York; Percy A. Sanguinetti, New York; E. A. Uehling, Carlstadt, N. J.; Forrest M. Towl, New York; H. D. Watson, New York; S. S. Webber, Trenton, N. J.; D. B. Bullard, Bridgeport, Conn.; Robert W. Boenig, Brooklyn, N. Y.; W. W. Chapin, Montclair, N. J.; C. H. Satherberg, Philadelphia, Pa.; George Mesta, Pittsburg, Pa.; H. M. Marble, New York; M. P. Wood, New York; Robert E. Hall, New York; A. L. Burns, New York; Edward F. Schnuck, Brooklyn, N. Y.; S. S. Jordan, Portland, Maine; Goold H. Bull, Fordham Heights, N. Y.; W. B. Coggswell, Syracuse, N. Y.; W. D. Woolson, Springfield, Vt.; W. S. Ackerman, New York; John B Mayo, Torrington, Conn.; R. M. Dyer, Chicago, Ill.; E. B. Katte, New York; G. S. Humphrey, Staten Island, N. Y.; Chas. L. Clarke, New York; H. L. Gantt, So. Bethlehem, Pa.; Lester G. French, New York; Geo. P. Richardson, Brooklyn; Henry D. Hibbard, Plainfield, N. J.; M. F. Moore, Roselle, N. J.; Louis G. Engel, Brooklyn, N. Y.; A. K. Mansfield, Salem, O.; Wm. A. Bole, Pittsburg, Pa.; M. C. Jenkins, Jersey City, N. J.; W. J. Hagman, Philadelphia, Pa.; Geo. E. Greenleaf, Plainfield, N. J.; Miss May Lauder, Thos H. Mirkil, Philadelphia, Pa.; W. F. Hunt, W. New Brighton, N. Y.; Wm. S. Washburn, Wollaston, Mass.; W. D. Sargent, Chicago, Ill.; McLaughlin, Philadelphia, Pa.; T. H. Briggs, Brooklyn; Walter L. Clarke, New York; George Rowland, New York; John Turner, E. Orange, N. J.; Geo. H. Cobb, Passaic, N. J.; A. L. Rohrer, Schenectady, N. Y.; A. S. Granger, Port Richmond, N. Y.; R. C. McKinney, New York; Geo. T. Reiss, Hamilton, O.; Oberlin Smith, Bridgeton, N. J.; W. H. Bailey, New York; Elwood Burdsall, Port Chester, N. Y.; James E. Greensmith, Trenton, N. J.; Henry Adams, Baltimore, Md.; Carl G. Barth, Bethlehem, Pa.; L. E. Bellows, Holyoke, Mass.; John T. Wilkin, Connersville, Ind.; John Sturgess, Troy, N. Y.; George L. Morton, Washington, D. C.; R. K. LeBlond, Cincinnati, O.; Forrest R. Jones, Worcester, Mass.; H. P. Fairfield, Worcester, Mass.; Thomas Veitch, Yonkers, N. Y.; Orville Benson, Edison, N. J.; W. H. Derbyshire, Chambersburg, Pa.; Paul J. Challen, Matteawan, N. Y.; John G. Aldrich, Providence, R. I.; E. G. Stroud, Stamford, Conn.; Ernest L. Smith, Stamford, Conn.; J. E. Sague, New York; Chas. H. Willcox, Westport, Conn.; Albert Kingsbury, Worcester, Mass.; Wm. H. Honiss, Hartford, Conn.; Wilfred Lewis, Philadelphia, Pa.; Samuel G. Reed, Boston, Mass.; Allan Ames, C. H. Zehnder, New York; Fred W. Taylor, Philadelphia, Pa.; V. E. Edwards, Worcester, Mass.; A. D. Finley, Port Chester, N. Y.; J. H. Patton, Brooklyn, N. Y.; W. S. Morehouse, Seneca Falls, N. Y.; Stanley G. Flagg Jr., Philadelphia; Mrs. J. P. Bland, Philadelphia; Elijah Dallett, Philadelphia; Clarence A. Fileston, guest of E. H. Foster, F. H. Ball, Plainfield, N. J.; A. J. Freth, New York; F. D. Herbert, New York; J. E. Johnson Jr., Longdale, Va.; E. P. Bullard, Bridgeport, Conn.; Geo. W. Melville, Washington, D. C.; Mrs. A. K. Mansfield, Salem, O.; A. Falkenau, Philadelphia, Pa.; A. T. Barnes, Sharon, Mass.; R. E. Leighton, Bayonne, N. J.; Augustus Wood, Philadelphia; F. J. Loomis, Waterbury, Conn.; Chas. L. Bailey, Torrington, Conn.; Warren S. Johnson, Milwaukee, Wis.; Chas. R. Gabriel, Providence, R. I.; Julian F. Scholl, New York; Henry S. Hayward, Jr., Franklin, Pa.; Edward L. Coster, Irvington-on-Hudson; Gustav Hillmann, Brooklyn, N. Y.; O. F. Nichols, Brooklyn, N. Y.; Reginald P. Bolton, New York; George Richmond, New York; Adalbert Harding, New York; D. L. Holbrook, New York; R. G. Davis, New York; Chas. Colahan, Chicago, Ill.; J. R. Waring, New York; Charles T. Brown, Nashville, Tenn.; Jos. A. McElroy, London, Eng.; Frederick L. Pryor, Hoboken, N. J.; C. Wayne Cunningham, Providence, R. I.; Alfred Clarke, Boston, Mass.

The first 27 persons on the list formed the local reception committee.

Many of the members were accompanied with ladies and guests bringing the number present at the convention to 700 persons.

Wednesday's Session.

The second session was called to order at 10 o'clock Wednesday morning, Dec. 4. The time was devoted to the annual reports of the council, the finance and library committees. Officers for the ensuing year were announced as follows: President, Edwin Reynolds, of the Allis-Chalmers Co., Milwaukee; vice-presidents, Wilfred Lewis, of the Tabor Mfg. Co., Philadelphia; M. E. Cooley, of the University of Michigan, Ann Arbor, and Milton P. Higgins, of the Norton Emery Wheel Co., Worcester, Mass. The treasurer, William H. Wiley, New York, and secretary, F. R. Hutton, New York, were re-elected.

The annual report detailed the business that had been considered by the council and the action taken during the year. At the first meeting of the council in December, 1900, a special committee of three was appointed to consider with the secretary the advisability of extending the usefulness of the secretary's office. As the result of the deliberations of this committee, the council approved a policy looking to a more active canvass for desirable papers to be read at the meetings, and, further, to the pursuit of certain lines of work with more vigor. In order to carry out these suggestions it was ordered that an additional assistant should be furnished the secretary, who should be a trained mechanical engineer and who should enter the office to supplement the work. The choice fell upon Arthur L. Rice, who began his duties just previous to the spring meeting of 1901. It was the opinion of the council that there were advantages connected with the more frequent issue of the "employers' bulletin" than had previously been made and that there were directions in which the society's library could be made useful to the members if there was constantly on duty at the society house a person competent to make references and prepare abstracts and similar work which could be done at the request of non-resident members.

The council had passed resolutions of thanks to the societies in Great Britain and France, to whose courtesy the society was indebted during the visit of the American engineers to the Exposition of 1900, and these resolutions have been handsomely illuminated and transmitted to the transatlantic societies. Mr. H. H. Suplee, who acted as a secretary for the committee during the stay of the American engineers in England, had been tendered a hearty vote of thanks for all that he was enabled to do.

A committee of the council has had under consideration the matter of holding reunions of members of the society in the society house intermediate between the regular semiannual meetings but was not prepared to submit a definite report at this time.

The council has considered a proposition to amend its rules, whereby a greater proportion of the voting membership should be required in order to bring about the defeat of a candidate seeking election to membership. The practice of the American Society of Mechanical Engineers is at present more rigid than that of the sister Societies in England or the Continent, in requiring only seven negative votes to defeat an election. The report of a committee of the council making a recommendation in this direction is in the hands of the council but has not received favorable action.

Twelve members had died during the year leaving the present membership as follows: Honorary members, 18; members, 1,615; associates, 159; junior members, 537, making a total of 2,329. The tellers reported the election of 49 applicants to full membership; associates, 10, and juniors, 37. One junior member was promoted to associate membership and eight associates to full membership.

At the meeting of the society in Milwaukee, May, 1901, notice was given of the following proposed change of the rules:

WHEREAS, A resolution has been presented in the Council by one of its members, looking to the advisability of an increase in the rate of the annual dues in the society, and whereas the Council has given favorable consideration to this proposition, notice is hereby given of an amendment to be taken up and considered at the annual meeting in December 1901, to amend Article 18, as follows:

"The initiation fee of a member or associate shall be $25,

and the annual dues shall be $25, payable in advance. The initiation fee of a junior shall be $15, and his annual dues $15, payable in advance. A junior being promoted to any other grade of membership shall pay an additional initiation fee of $10. Any member or associate may become a life member, in the same grade, by the payment of $350 at one time, and shall not be liable thereafter to annual dues."

The amendment was formally placed before the meeting by C. W. Hunt, who went into a careful discussion of the financial resources of the society. He pointed out the disproportionate advantage enjoyed by the life members who had commuted their payments at an unusual rate of interest and suggested economies in the conduct of the business, the abolition of the pocket list of members, sending of papers in advance, etc. He assured the members of the cordial co-operation of the council, irrespective of the result of the vote. Mr. Henry R. Towne did not wish it to be understood that the society was in any danger of bankruptcy. The resources were ample and the credit good for an indefinite period. He thought the emergency could be fully met by a less radical increase of dues, and proposed $20 for members and associates and $12.50 for junior members. This would increase the income about $9,000, and would clear off the debt in a year and a half. The general discussion cleared up many opportunities for misunderstanding. For example, when it was pointed out that the members living in or near New York could attend the meetings and make more frequent use of the benefits to be derived from residence within easy reach of headquarters at no greater expense for dues than out-of-town members, the rejoinder was made that the New York members appreciate this matter and freely contribute to the fund for entertainment of the visitors.

Another speaker advocated the increase of dues on the ground that thereby original investigation and research could be undertaken by representatives of the society and instanced the paper to be read by Prof. Benjamin on the testing of small flywheels to destruction. These wheels had been limited to 24 inches in diameter, but experiments along this line could be conducted on much larger flywheels if the funds were provided. At a later session Prof. Benjamin asserted that after some little experience with 24-inch flywheels ruptured at high speeds he thought any one would not care to extend their acquaintance in that line of experimentation with wheels of larger dimensions. M. N. Forney thought it would be unwise to adopt the proposed amendment to the rules until the members thoroughly understood the condition of affairs and advocated the voting down of the pending resolutions; that the council should prepare a statement of the resources and liabilities of the organization for distribution to the members, so that a more intelligent vote could be taken at the next meeting. This view of the situation seemed generally acceptable, and a vote on the amendment was taken. The vote was announced by the committee, Messrs. Fred, J. Miller, H. H. Suplee and L. R. Pomeroy, at the meeting the following morning, as follows: No, 647; yes, 191; irregular, 36; total, 874, and the amendment was lost.

Wednesday evening a reception and conversazione was held at Sherry's, at 44th street and Fifth avenue. This was the distinctively social event of the meeting and was largely attended by the members and their ladies.

Thursday's Session.

The reading of professional papers was commenced at the meeting held on the morning of Dec. 5, and continued in the order of the program already published in these columns. Some account of the discussions will be appended to the abstract of the papers selected for publication in *The Iron Trade Review*. At the close of the reading of the professional papers as announced, a member of the society, Anthony Victorin, of the Ordnance Office, the War Department, Washington, described some interesting phenomena incidental to strains brought upon the bearing blocks of a heavy gun carriage. The load amounted to 800,000 pounds, the radius of the supporting sector 114 inches, and the face bearing of the supporting blocks 12 inches. Mr. Victorin had found that the micrometer had shown a minus reading on the removal of the load instead of the zero one would anticipate. The tests had also been taken with tissue paper intervening between the surfaces, and this showed a marked discoloration in a narrow band defining each side of the contact; the print having a wider contact as it approached the edge of the bearing block indicating the greater readiness of the material to give way. The discoloration being caused by the oil pressed out of the steel.

Thursday afternoon, Dec. 5, was set apart for the ceremonies in connection with the unveiling of the monument to Robert Fulton. The plans for the designing and erection of the monument in the church yard of Trinity church, New York, had been in the charge of a committee of the society, consisting of G. C. Henning, C. W. Hunt and Henry H. Suplee. The ceremonies began with addresses delivered at the Real Estate Exchange. Rear Admiral George W. Melville spoke of the great advances in marine engineering since the time of Fulton, and made some comparisons between Fulton's steamboat and the construction of the modern steamer. Dr. Robert H. Thurston, director of Sibley College, Cornell University, gave a brief account of Fulton's life and career. A letter was read by Mr. Henning from Commodore B. F. Isherwood, who was chief engineer during the civil war. Commodore Isherwood said that although in the natural development of the knowledge and employment of steam power, steamboats would certainly have been invented sooner or later, yet Fulton had by his genius shortened the period before such a discovery by many years and done a work of incalculable value. "In erecting a monument to Robert Fulton we honor ourselves. He does not need our recognition or our homage. There is a monument to Fulton wherever a steamboat floats."

After the addresses by members of the society a short service was held in Trinity church, conducted by Dr. Morgan Dix, at which the Rev. R. F. Crary, of Poughkeepsie, a grandson of Fulton, made an address. The president of the society, Samuel T. Wellman, of Cleveland, unveiled the monument immediately after this service.

The monument is of granite, bearing on the face a bronze portrait in high relief of Robert Fulton. The portrait is taken from an oil painting made by Fulton himself, which is now in the possession of the American Society of Mechanical Engineers.

The meeting came to a close on Friday with the passing of a resolution of thanks to the committee on standardization after a most interesting and useful convention. The spring meeting will be held in Boston.

Wickes Bros., of Saginaw, Mich., report a large business in all their lines, including water-tube boilers, boiler-shop and ship-yard tools, saw-mill machinery and second-hand machinery. Their water-tube boilers and boiler shop tools are sold not only from Saginaw but also from their branch offices at Chicago, Pittsburg and New York. Their stocks of second-hand machinery are about evenly divided between their Pittsburg plant and the home plant at Saginaw. The machinery business of the firm has grown to such an extent that they have been compelled to build an additional machine shop 80 feet wide and 220 feet long, fitted with two electric traveling cranes and with the latest tools. There is included in the plant a large, heavy pit lathe, built by Wickes Bros., that will handle wheels of any size up to 30 feet diameter and 10 feet face, and which is now engaged in turning some plate glass grinding tables or discs 25 feet in diameter. These pit lathes have been made for such concerns as the E. P. Allis Co., the Filer & Stowell Co., the Nordberg, Mfg. Co. and Jones & Laughlins, Ltd., and they are built as a part of the Wickes Bros.' regular line of tools. The shop also has an extra heavy triple geared 60-inch engine lathe of the Wickes Bros.' own manufacture.

The Marion Mfg. Co., of Marion, O., manufacturer of the Leader threshing machines and of portable engines, made 25 per cent greater output in the season of 1901 than in any other. The plant is now running full force. The sales department of the business is thoroughly organized and the business this year was 100 per cent better than in the corresponding period of 1900.

ELECTRIC POWER IN AN ENGLISH TUBE MILL.

The firm of Lloyd & Lloyd, Limited, of Birmingham, Eng., is well known as one of the most important engaged in tube manufacture in that country. It was originally established in 1850. The works at Birmingham, Halesowen and Old Hill, Staffordshire, give employment to several thousand people and turn out many miles of tubes of various forms daily. The most recent step in advance has been the installation of a complete electrical equipment for power generating purposes in the Halesowen works. This plant is installed in a separate building located near the center of the works. There are two generating units, each of 100-h. p. capacity, consisting of Westinghouse combined sets. The engines are the Westinghouse compound, single-acting type, having cylinders 12 inches and 20 inches in diameter by 12 inch stroke.

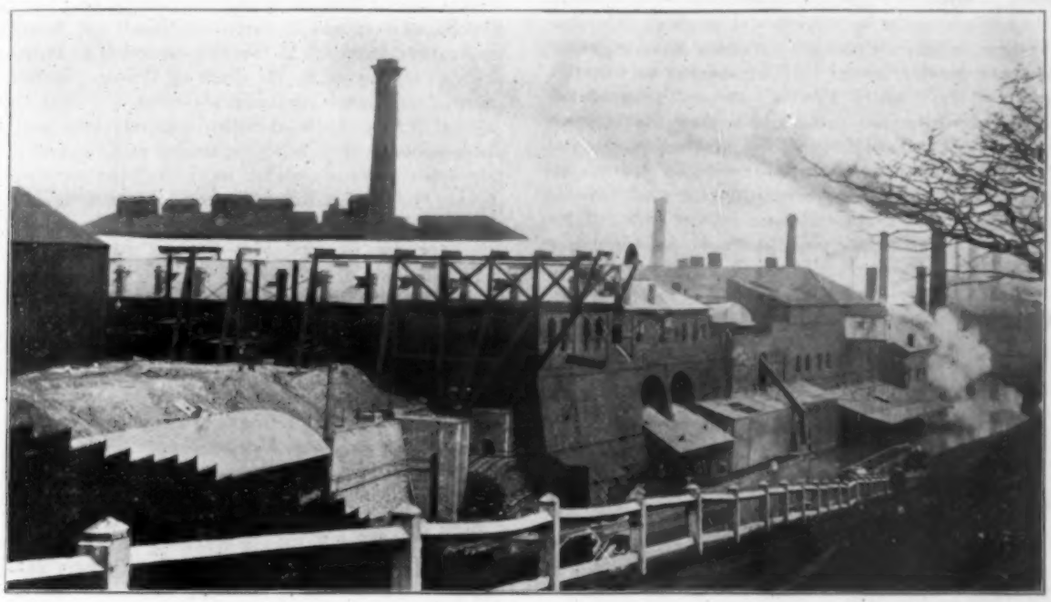


FIG. 1.—TUBE WORKS OF LLOYD & LLOYD, HALESOWEN, WEST BIRMINGHAM, ENG.

The crank shaft of each engine is extended to receive the armature of a Westinghouse compound-wound engine-type generator. This generator delivers 75-k. w. at a pressure of 250 volts, running at a speed of 300 revolutions per minute. The field of the generator consists of a vertically divided yoke ring, the two halves of which are set on guide-plates, with suitable facilities for drawing the two halves easily apart and exposing the entire armature and field windings. The circular field has six internally projecting poles. These are built up of soft steel laminations cast in the yoke ring. The series coil and the shunt coil of each pole-piece are wound on separate forms, and insulated before being placed in position. The series winding is of copper strip forged into shape and wound edgewise. The armature is built up, together with the commutator, on a single cast-iron spider, the spider being keyed onto the engine shaft extension. The armature coil is slotted to receive the coils of the windings. The coils are formed and insulated before being placed in position, where they are placed without any binding or hammering, and secured by hard fibre wedges, driven into small notches in the core slots above the conductors. Binding wires are thus dispensed with, and the whole arrangement is one which conduces to easy repairs or renewals. The commutator is built up on a projecting boss of the cast-iron spider. It is of hard copper segments, insulated by prepared sheets of mica of corresponding hardness,.

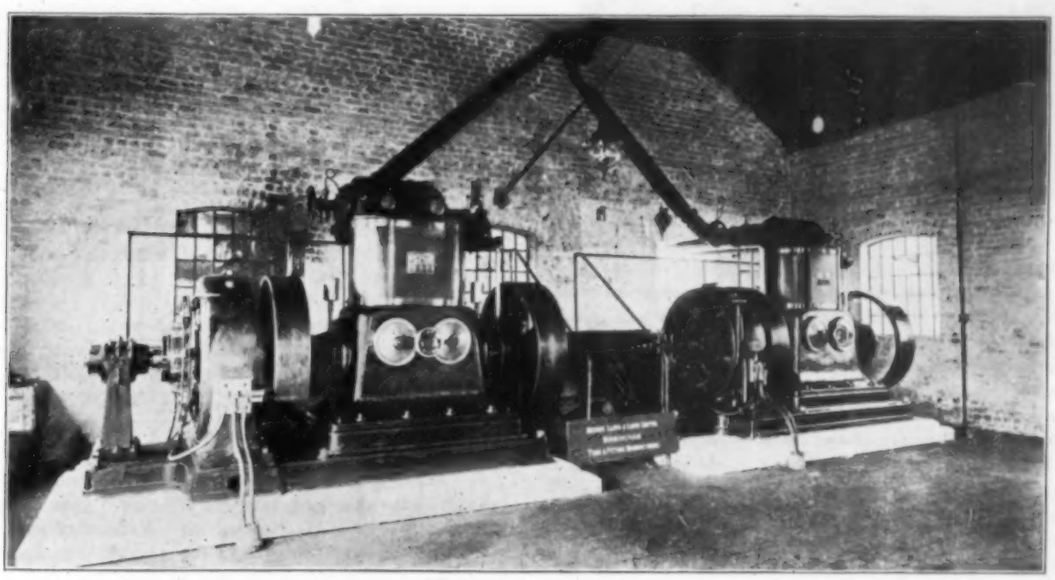


FIG. 2.—GENERATOR OF 75-K. W. CAPACITY DIRECT CONNECTED TO COMPOUND ENGINE.

This form of construction of the rotating part of the machine secures rigidity, and should it ever be necessary to remove the armature, it may be done without the necessity of having to disturb the connections between the armature and the

commutator. The brush holders are secured to a ring supported by brackets from the field ring casting, thus leaving the outer end of the commutator free for cleaning and inspection. Carbon brushes are used. Each engine and its generator are set on one bed-plate.

The main switchboard for the control of the generating plant and the outgoing feeder circuits are of the usual Westinghouse construction. The motors, of which there are at present five installed, are each located in small dust-proof chambers, as near the respective centers of the works sections to be driven as possible. Power is transmitted from the motors to the various shafts by machine-cut gearing. The motor controlling switches, rheostats, cut-outs, etc., are placed alongside the respective motors. All of the motors used for the works are of the standard Westinghouse multipolar, shunt-wound type, the principles followed in their construction being very similar to those of the generators described. Cool running is thereby secured as well as unusual capacity for runs at high over-loads. The motors include one of 75-k. w. and 40 of 30-h. p., each. In addition to those installed for operating the various machine tools in the works, there is a dust-proof motor operating a single rail traveling crane in

FIG. 3.—MULTIPOLAR D. C. MOTOR OPERATING SHAFTING.

the yard. This consists of a carriage running overhead, suspended from a single girder rail, and is used for conveying material to and from the various parts of the yard and buildings.

The various procession of manufacture employed in the works include the gas welding process for making large tubes and flues. This was first adopted in these works as the result of costly experiments carried out by Messrs. Lloyd & Lloyd. The Bernardos process of electric winding was also introduced here from Russia. The firm is the sole licensee in England of the patent relating to the process, and has developed the details of the method, and granted licenses to many firms during the past ten years. It is used in the works at Halesowen for the production of large steam tubes for high pressure, and for various other high pressure fittings. There is also an extensive modern galvanizing plant used for the production of high-class galvanized tubes. The tubes turned out at these works vary in size from one-eight inch up to several feet in diameter, and they are used for every class of work, including gas, steam, air, and water transmission. Special tubes manufactured are boiler tubes, gas, water and steam tubes, and fittings, pipe lines for oil, tubular coils for refrigeration or heating, etc.

PERSONAL.

Changes in the legal department of the United States Steel Corporation at Duluth, Minn., have been announced. J. B. Cotton, formerly attorney for the Rockefeller interests has been appointed solicitor general of the transportation interests of the United States Steel Corporation. Billson, Congdon & Dickinson become general solicitors for the mining interests. T. B. Kellogg of St. Paul has been appointed general counsel for both the mining and transportation interests.

At a special meeting of the directors of the American Car & Foundry Co., held last week at New York, Vice-Chairman and ex-President W. X. Bixby, was elected chairman to fill the vacancy caused by the death of William McMillan. The office of vice-chairman was abolished.

John G. A. Leishman, envoy extraordinary and minister plenipotentiary to Turkey, spent several days in Pittsburg last week.

John Hall & Co., Limited, 95-97 Liberty street, N. Y., have been appointed sole agents for Jones & Laughlins, Ltd., of Pittsburg, for England and Wales. The English branch is Hall & Pickles, Manchester.

A. M. Hobson, manager of stores and paymaster for the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., has resigned. The management of stores will be placed in the hands of the purchasing agent, while F. P. Jarvis has been appointed paymaster.

Benedict Crowell, of the firm of Crowell & Peck, mining engineers and chemists, Cleveland, is in South America examining newly developed mineral deposits.

The following changes are reported in the board of directors of the Empire Steel & Iron Co.: Mark T. Cox, of Robert Winthrop & Co. in place of W. L. Sims, resigned; Charles H. Zehnder, late president of Dickson Mfg. Co., in place of E. K. Sumerwell, resigned; David B. Gamble, of Proctor & Gamble, in place of W. E. Scarritt, resigned.

L. Hoover, formerly auditor of the National Steel Co., has been appointed auditor of the Tennessee Coal, Iron & Railroad Co., with offices at Birmingham, Ala.

Superintendent George H. Lowe of the Valley plant of the Republic Iron & Steel Co., Youngstown, O., has signified his intentions of resigning at an early date. His successor has not yet been appointed.

O. B. Warren has been appointed superintendent of mines by the Donora Mining Co., one of the subsidiary companies of the Union Steel Co., of Pittsburg. Fred Keyes has been appointed assistant to Mr. Warren.

J. Wendell Cole, of Columbus, O., the well-known sales agent for Detroit emery corundum wheels and for the Sellers grinders, was married on Dec. 4 to Miss L. B. Strickland, of Columbus. Mr. and Mrs. Cole have gone on a trip to Florida.

Fifteen employes of the Upper and Lower Union mills of the Carnegie Steel Co., Pittsburg, have received blocks of United States Steel Corporation bonds during the past week. The recipients are: Charles Davison, Thomas Nelson, Thomas Evans, John A. Scott, Thomas Higgins, Charles Clowse, Oliver Waggoner, Joseph Brown, Edward Miller, Edward Berger, George Kirbey, James Dugan, Morgan Brown, Kenneth Lean.

Our attention is called to a misinterpretation of the footnote on p. 24 of our issue of Nov. 28, in connection with a portion of a paper by C. R. Van Hise on "Canadian Iron Ore Deposits." The extract there printed was, as the footnote states, from a monograph on "The Iron Ore Deposits of the Lake Superior Region." It was prepared for the annual report of the U. S. Geological Survey and not for *The Iron Trade Review*.

The new machine shop of the Vulcan Manufacturing Co., New Castle, Pa., will be completed shortly after the first of the year, and the installation of new machinery will then be pushed in order that the plant may commence operations by Feb. 1. The new building is three stories high, 100 feet long and 75 feet wide.

HEAT TREATMENT OF CAST IRON.*

BY JOHN G. SADLIER, SPRINGFIELD, O.

Combustion plays a most important part in the history of all metals, as without heat it is impossible to produce or use them. The ores of iron, as they are mined, vary much in appearance, some being hard and rocky, and others again resembling different colored clays. These ores, when charged with a sufficient amount of limestone and coke or charcoal, are reduced to metallic iron. Usually there are several varieties of ores used by the furnaceman to produce the grades of iron desired for the different requirements. The chemical constitution of the respective ores enables the furnaceman to do this.

It is held that iron would be all of the same character if the impurities could be removed from it. I do not believe that this is true. There are to my mind as great differences between the irons produced from different ores, as there are differences between the timbers growing in the woods. Some woods show great strength and elasticity, while others are very brittle; some varieties are very soft, while others are very hard.

It is true that the elements entering into the composition of cast iron play a most important part, yet the irons showing the same composition will not always, under the same circumstances, show the same physical characteristics. As the physical qualities are the ones which make cast iron valuable for mechanical purposes, too much care cannot be taken at the blast furnace to get the right ores and the right compositions of the resulting pig irons. With the proper care thus exercised, and a good furnace in proper working order, there need be no doubt as to the quality of the resulting iron.

The iron is now ready for the second process. It goes to the converter for Bessemerizing into steel, or into the air or open-hearth furnace, or into the cupola. In the case of the "malleable" or "steel" furnaces, heated as they are up to the melting point of the metal which is charged cold, it is interesting to note how the iron greedily absorbs the heat, as a sponge takes up water. The crystals begin to separate, and finally the whole mass sinks together, a wonderful change from a solid, hard substance to a fluid molten mass.

Now, as there is much gas absorbed by the melted bath of iron from the waste products of combustion, and again much of this remains in the iron when solidifying, it is highly important to have the combustion in the furnace just right. Thus, if there is too much air introduced into the furnace, in proportion to the fuel used, some of this results in an oxidation and consequent hardening of the metal. Then again, if there is too much fuel for the amount of air, the result is equally bad, as carbonic oxide is formed, which is also absorbed, forming the blow holes so often seen in castings of steel and iron.

Now, what is true in the furnace also holds good in the cupola, so far as charging too little coke and putting on too much blast is concerned. Iron melted under these conditions, when first tapped, may show up very hot; yet when conveyed to the mold in hand ladles, chills very rapidly, and in the smaller castings, or light sections of the heavier ones, there will be found under the skin a lot of blow holes. If too much coke is charged the melting zone is raised in the cupola, and the melted iron running down through the thick bed is too long in contact with the blast. The consequence is a species of converter action which is highly undesirable. Too much care cannot be taken to charge the proper amount of coke best suited to the blast.

A pressure indicator on the blast pipe is not a reliable guide, for if the material charged is fine, it is apt to obstruct the passage of the air and show an apparently high pressure. The best guide, therefore, is to carefully observe the melted iron as it runs from the spout, which to the carefully trained, experienced man, shows what is going on within, just as though he were looking into a stream of clear or muddy water. In the latter case he would soon know there was something wrong.

The iron as it runs out will contain much absorbed gas which escapes at the point of set. If you were to cool suddenly the ladle of metal as it stands at the cupola, if the iron were of the chilling variety, the entire mass would become one chill. From this sudden chilling to keeping the iron fluid as long as possible before it sets, and then letting it cool off gradually, there is an effect on the fracture to be observed which is of great interest. In the first case there will be no appearance of crystals, while in the last large flakes may be observed with the structure very open and porous. In all sections of castings, according to their thickness, from one-eighth of an inch to twelve inches, you will find a closing of the grain gradually towards the lighter section.

From the foregoing it will be seen that the bringing out of two points is aimed at. First, that the same mixture of iron, melted under the different atmospheric and heat conditions which may prevail at the time, will not produce the same grade of iron in the castings. Second, melted iron poured into a large ladle where it may become thoroughly mixed, will not produce the same grade of castings, if poured against a chill, in a small section or in a large section. In the first case the absorption of gases will vary, and the constituency of the melted mass is variable. In the second, the sudden chilling locks up all the occluded gases in the small sections, while allowing most of them to escape in the larger, slower cooling ones. The consequence will be the formation of the gas pockets above mentioned. Melted iron coming in contact with anything which would cause agitation, such as moisture from overly damp sand, or the pouring into hard molds, shows the same characteristics.

The conclusion therefore is that to obtain a certain character of iron in a casting, reliance must not be placed entirely upon the nature of the iron charged into the cupola; but the atmospheric conditions, coke, blast and character of casting to be made are also important factors; a most important one being the getting of a proper combustion.

*Prepared for the December meeting of the Foundrymen's Association and published as part of the Journal of the American Foundrymen's Association.

Progress of Industrial Conciliation.

The first annual meeting of the industrial department of the National Civic Federation will be held at the New York Board of Trade and Transportation, New York, Dec. 16 and 17. The object of the industrial department is to attempt to federate the representatives of the large employing corporations and associations, the leaders of large labor organizations and representatives of the general public for the purpose of establishing the principles of concilation and voluntary arbitration as the best means to prevent strikes and lockouts. The principal topics to be discussed are "The Effect of Machinery on Labor," "The Shorter Hour Movement" and "The Joint Agreement Method of Preventing Strikes and Lockouts." A permanent executive board will also be chosen. Representatives from the large corporations, the American Federation of Labor, the railway brotherhoods and professional men who are interested in the labor problem are expected to participate. Among those invited to take part are Samuel Gompers, John Mitchell and Theodore Shaffer, representing labor organizations, and on the side of capital Senator Hanna, President Schwab, S. R. Callaway, president of the American Locomotive Co.; James A. Chambers, president of the American Glass Co.; Francis L. Robbins, president of the Pittsburg Coal Co.; E. P. Ripley, president of the Atchison, Topeka & Santa Fe Railroad.

The government of New South Wales has just put legislation on the statute books that follows closely in some particulars the far famed New Zealand plan of arbitration and conciliation. The industrial arbitration bill, which has just been passed, according to a Sydney, N. S. W., cablegram, will not only compel reference of all disputes between employers and employes to a competent court, with power to enforce its orders and award, but makes a strike or a lockout before or pending such reference a misdemeanor punishable by a fine or imprisonment. The court which will pass upon these disputes is to be presided over by a judge of the supreme court, and will have most extensive powers, including the power to declare a standard wage and to direct that, other things being equal, an employer shall give preference to union over non-union laborers. There is no appeal from the decisions of this court.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Hildreth Motor & Pump Co. has been organized at North Lansing, Mich., to manufacture gasoline engines and pumps. The company is capitalized at $20,000, fully subscribed, and the plant of Hildreth & Co., has been secured to carry on the new business. In the spring an addition will be built to the plant. Lawrence Price has been elected president, W. W. Hildreth, vice-president; L. L. Sattler, treasurer, N. E. Hildreth, general manager, and W. E. Cady, superintendent.

Messrs. W. T. Heck, Cloyd Marvin, A. C. Heck, O. H. Gierhart and W. E. Gierhart have organized a company of Findlay, O., for the purpose of erecting a machine shop and foundry. Capital, $50,000. A plant will be erected immediately and operations will be commenced in the spring.

The Garwood Foundry & Machine Co., of Plainfield, N. J., has been incorporated with $50,000 capital to carry on a general foundry and machinery business. J. C. Pierson, J. B. Coriell, Charles Poor and A. J. Wilson are the incorporators.

C. L. Grimes, superintendent and James F. Warren, foreman of the plant of Williams, White & Co., Moline, Ill., have acquired a majority interest in the plant of the Glofe Iron Works, Wichita, Kas., and have changed the name of the company to that of the Wichita Mfg. Co.

The Southern Metal Co., of Orangeburg, S. C., has been incorporated with a capital of $10,000. T. E. Hoffman, J. B. Outland, J. G. Wannamaker and M. O. Dantzler are the incorporators. The company will manufacture sheet iron products.

Castree & Son, machinists, Owosso, Mich., are in the market for a second-hand planer, about 24 x 24 inches x 6 feet.

The New Brunswick Foundry at Newark, N. J., which has been idle for more than a year, will be placed in operation shortly by the Brunswick Refrigerating Co.

John Vogt & Co., of New York, have been incorporated to sell boilers and machinery. The capital stock is $5,000 and the incorporators are Charles Vogt, John Vogt and William Vogt, of Brooklyn, N. Y.

The Uneeda Tool & Machine Co. of Martins Ferry, O., has been incorporated with $50,000 capital. A. B. Gordon, W. L. Brown, G. W. Reece, Robert Jones and G. T. McGue are the incorporators.

The Coatesville Iron & Steel Co. has been organized at Coatesville, Pa., to operate the Valley Iron Works, one mile north of Coatesville.

The Co-Operative Wagon & Machine Co. and the Consolidated Implement Co. of Salt Lake City, Utah, have been combined with a capitalization of $1,500,000. The name for the new corporation has not yet been decided upon. Joseph Smith has been elected president, W. S. McCormick, vice-president; M. D. Wells, secretary and F. R. Snow, treasurer.

The plant of Kenney & Co., Scottdale, Pa., will be rebuilt immediately, having been destroyed by fire recently. A newly organized company will operate the plant under the old name. The capacity of the plant will be greatly increased, however. The capital stock issued is $125,000. A. K. Stauffer has been elected president; D. B. Stauft, secretary; W. F. Stauffer, treasurer and T. C. Kenney, general manager. The output of the plant will consist of coke oven and coal mine machinery, and the equipment for the plant is now being purchased.

The C. H. Scott Mfg. Co. of Chicago, Ill., has been incorporated with $10,000 capital. The company will manufacture machinery. A. R. Hayes, L. A. Hubbard and E. S. Cummings are the incorporators.

The Crescent Brass & Iron Co. of Detroit, Mich., has been succeeded by the Buckley-Hart Mfg. Co. The company manufactures cabinent hardware.

The Exeter Iron Co., of Philadelphia, Pa., has been incorporated with $60,000 capital.

The Port Huron Malleable Co. has been organized recently and plants have been prepared and contracts let for the erection of a malleable iron foundry. The plant will have a capacity of about 10 tons at the beginning, and will be so constructed as to admit easily of enlargement as additional capacity is needed. Port Huron concerns into whose products malleable iron castings enter to a considerable extent, are interested in the new enterprise because of the difficulty they have found times in getting malleable as needed. The new company has assurance of a large business also outside of the home consumption. Richard Corcoran, of Albion, Mich., becomes general manager and superintendent. His first engagement in the malleable business commenced 35 years ago with Westmoreland Malleable Iron Co., of Westmoreland, N. Y. After 15 years he went to Detroit to take charge of the Michigan Malleable Iron Co.'s foundry. Eight years with this company were followed by an engagement with the Albion Malleable Iron Co., and after 12 years at Albion he has resigned to go to Port Huron.

Fires and Accidents:—

The warehouse of the American Sheet Steel Co., at Canal Dover, O. ,was destroyed by fire last week, entailing a loss of $10,000.

At Alton, Ont., the foundry of Alexander Dick was totally destroyed by fire on Dec. 4; loss, $8,000.

New Construction:—

The Spokane Galvanized Wire Pipe Co., Seattle, Wash., have purchased two unoccupied factory buildings which they will equip with modern machinery for the manufacture of their wire pipe.

Young Brothers of Detroit are erecting a factory building 95x100 feet. They will engage in the manufacture of smokestacks, exhaust pipes, etc.

The St. Louis Iron & Machine Co. will erect a four-story pattern and machine storage house to cost $7,000.

An addition to the O. P. Chatfield brass foundry, Marinette, Wis., will shortly be built, which will practically double the output of the plant.

The Toledo Wire & Iron Works, Toledo, O., will erect a new four-story factory building which will include a large basement for the installation of the power plant. The building will be 50x111 feet.

The Union Foundry & Machine Co., Allentown, Pa., will erect a pattern and storage house two stories high and 50x100 feet in size.

The Parkersburg Iron & Steel Co., Parkersburg, W. Va., will erect a forge shop 110 x 225 feet.

Plans have been made for a large extension of the plant in Fair Haven, Conn., of the National Wire Corporation, which was destroyed by fire several months ago. With property just acquired by purchase, the corporation now owns 30 acres of land, and 10 or 12 buildings will be erected.

The Pittsburg District:—

The Wisconsin Graphite Co., Pittsburg, commenced operations in its new plant, Allegheny, Pa., last week. The equipment of the plant consists of three grinding mills and three mixers, which will enable the company to make prompt deliveries on all business. Orders for additional machinery have been placed during the past few weeks for $25,000 worth of machinery, both for installation in the Allegheny, Pa., plant and at the mines, Junction City, Wis. After the first of the year the company will be in the market with a full line of flake graphites. A new department has been opened by the company to be known as the "cold water paint department." Arrangements have also been made to handle the products of the Casein Co. of America, for the territory between Columbus, O., and Altoona, Pa. One of the large orders recently placed with the company include 25 cars of mineral red for delivery in Brooklyn, O., while another called for 5 cars of graphite.

The Fort Pitt Forge Co., Pittsburg, Pa., whose plant for the manufacture of forgings, foundation and bridge rods was placed in operation several months ago, has recently added a number of rivet machines for the manufacture of structural and boiler rivets. Since the plant has been in operation the company has enjoyed a good demand for its products and the outlook for next year is reported very favorable.

The James H. Baker Mfg. Co. of Pittsburg, Pa., has de-

cided to increase its capital stock from $100,000 to $500,000. The additional capital stock will be used to provide for big extensions to the plant located at Tarentum, Pa.

The Pittsburg Twist Drill & Tool Co. of Pittsburg has been organized to manufacture machinery and tools.

The new office building of the Riter-Conley Mfg. Co., which is being erected on Water street, Pittsburg, will be ready for occupancy shortly after the first of the year. The new building is of fire brick, four stories high, 160 feet long and 48 feet wide.

The Star Enameling & Stamping Co., of Allegheny, Pa., which went into the hands of a receiver last September has been reorganized by C. E. Christman and associates. All the assets of the company, with the exception of book accounts, have been purchased from the Pennsylvania Trust Co., receivers for the former company. The new company has been reorganized under the old firm name and a New Jersey charter has been secured with a capitalization of $100,000. Officers have been elected as follows: C. E. Christman, president and general manager; J. Roth, vice-president; A. F. Loeb, treasurer, and G. W. Robbottom Jr., secretary. The output of the plant will be greatly increased by the installation of much new machinery. There is no truth in the report that the plant is to be removed to McKeesport.

Orders now on the books of the Pittsburg plant of the American Locomotive Works will keep it in full operation until next July. One of the largest orders placed with this plant calls for 19 locomotives and was placed by the Pittsburg & Lake Erie Railroad.

The Pressed Steel Car Co., Pittsburg, Pa., has received an order for 1,000 steel hopper and ore cars from the Pittsburg, Bessemer & Lake Erie Railroad. The cars will be of 100,000 pounds capacity.

At a meeting of the stockholders of the Pittsburg Steam Jacket Lubricating Co., held at Pittsburg last week, it was decided to increase the capital stock to $10,000. The company manufactures a steam jacket lubricator, invented by George L. Brisbin. A plant for the manufacture of the lubricators will shortly be built in Pittsburg.

The H. K. Porter Co. of Pittsburg last week shipped two light locomotives to a coal firm in Johannesburg, South Africa. Another similar shipment will be made to this company the latter part of this month. Up to date the Porter company has shipped about 20 locomotives to South Africa.

The Pittsburg Construction Co., with offices in the Bissell Building, Pittsburg, has been awarded the contract for the erection of the new plant of the Ft. Pitt Malleable & Gray Iron Co., at McKees Rocks, Pa. The contract for the Fort Wayne connection to the Ohio connecting bridge has also been awarded this company.

On December 26 a charter for the incorporation of the Westinghouse Foundry Co., of Pittsburg, will be applied for. The foundry will be located at Trafford Park, near Stewart Station, Pa., on the Pennsylvania railroad. The incorporators will be George Westinghouse, H. H. Westinghouse, George C. Smith, William Scott and W. D. Updegraff. The foundry buildings and yards will require about 25 acres. Upon their completion the foundries controlled by the Westinghouse interests in Pittsburg, Allegheny and Cleveland, O., will be abandoned.

Furnace D of the Edgar Thompson plant of the Carnegie Steel Co., Rankin, Pa., was blown in last week. The furnace was out about six weeks undergoing repairs and receiving a new lining.

After January 1, 1902, the business of David Lamond, engineer and contractor, of Pittsburg, will be carried on under the firm name of D. Lamond & Son, the members of the firm being David Lamond and David D. Lamond.

David Lamond, Ferguson Block, Pittsburg, has under contract at the present time three rail mill furnaces 36 ft. 6 inches by 12 feet to be erected at Tremly Point, N. J., for the American McKenna Process Co. In connection with these furnaces the same firm has a contract for six boilers of the Hyde type. This is the third plant of furnaces David Lamond has had for this company, one being at Joliet, Ill., and one at Kansas City. Among other contracts are one for two C. H. Foote fire brick stoves 16x65 ft. at Sligo, Mo., for the American Steel Foundry Co., St. Louis, Mo.; one Foote stove 19x75 ft. at Scottdale, Pa., for Corrigan, McKinney & Co., of Cleveland; one Foote stove 20x82 ft. for the Marting Iron & Steel Co.'s furnace plant, Ironton, O.; one Foote stove 20x75 ft. for the Dayton Coal & Iron Co., Ltd., at Dayton, Tenn. All of these are now under way.

General Industrial Notes.—

The Eagle Specialty Co. of Milwaukee, manufacturers of steel specialties for machines, has been adjudged an involuntary bankrupt.

The Enterprise Foundry Co. of Bristol, Tenn., has grown to such an extent that its business will be divided. The original company will devote its time exclusively to the manufacture of stoves and to repair work. The boiler shops and brass foundry have been leased to Bateman & Frost, who will conduct this part of the business.

The Cranberry Iron Co., has taken charge of the Carnegie Furnace at Johnson City, Tenn., and will make repairs.

A large interest in the firm of Morrison, Colwell & Page of Cohoes, N. Y., was transferred to the Cohoes Rolling Mill Co. last week. The consideration was $450,000. The transfer was only formal, as the first named concern has been known as the Cohoes Rolling Mill Co. since its reorganization.

The Tuscora Steel Co.'s sheet plant at Newcomerstown, O., is rapidly nearing completion. The main building, which will contain four hot mills and the same number of cold mills, is 110x256 feet, the galvanizing department 50x120 feet and the corrugating and roofing department 62x240 feet. The first two buildings are completed and are awaiting the installation of machinery. E. E. Erikson, of Pittsburg, Pa., is the consulting engineer.

The Fleming Boiler Works of New Castle, Pa., have received an order for six new stacks for the National Steel Co.'s plant at New Castle. They will be 155 feet high and seven feet in diameter. The National Steel Co. will also install six boilers, the contract having been placed with the Babbock & Wilcox Co. of New York.

The mechanical engineering department of the Republic Iron & Steel Co. was opened last week at Youngstown, O., with Willis McKee in charge. Heretofore S. V. Huber & Co. of Pittsburg, Pa., have had charge of the engineering of the company, and will be retained as consulting engineers.

On Thursday, Dec. 5, the night gang employed in the converting department of the Ohio plant of the National Steel Co., Youngstown, O., produced 563 ingots, thus breaking all previous records.

The Cleveland Axle Mfg. Co., Canton, O., has started up in part its machine department and hammer and forge shops, recently burned. It is expected the entire plant will be in operation next week.

The Carnahan Tin Plate & Sheet Co., of Canton, put two of its six mills in operation this week. It is believed the entire plant will be in operation by the first of the year.

A. F. Smith & Co., New Brighton, Pa., dealers in clay, brick, coal and builders' supplies, have been succeeded by the A. F. Smith Co., which has plans for a considerable expansion of the business.

The plant of the Tacony Iron & Metal Works, Tacony, near Philadelphia, Pa., was sold at receiver's sale last week to Charles Potter, the former president of the company. The bid was $12,200 above the liabilities of the concern, which amount to $49,764.54.

The American Tube & Stamping Co., which recently acquired the business, plant and good will of the Wilmot & Hobbs Mfg. Co., of Bridgeport, Conn., is contemplating improvements which will greatly increase the output. To secure better facilities it is altogether probable that the plant will be removed from Bridgeport, although no definite decision has yet been reached. An open-hearth plant with a capacity of from 200 to 300 tons per day will be built. At the present time the plant is dependent upon the open market for its supply of billets. A three-story fire proof building is also to be built, to be used for the manufacture of patented specialties, and this will include fire proof tool and die vaults. The capital stock of the company is $2,800,000.

It is reported that negotiations are under way for the removal of the plant of Thomas Devlin & Co. of Philadelphia to Burlington, N. J.

EXTENSIONS IN STEEL CORPORATION PLANTS.

NEW YORK, Dec. 11.—The advisory board of the United States Steel Corporation is considering many improvements and enlargements that are to be made to the properties of the subsidiary companies in the coming year. The inspection tour made last month by President Schwab and other officials of the country was for the sole purpose of considering suggestions made by the various district managers. First of all the steel producing capacity of the corporation is to be increased, inasmuch as the output of finished material is far in advance of that of the Bessemer converters and open-hearth plants. Furthermore the United States Steel Corporation, or rather a number of its constituent companies, such as the Carnegie and National Steel companies, have contracts with various independent producers to supply them with a stipulated tonnage of billets, sheet and tin plate bars and in many instances these contracts have several years yet to run.

Before the United States Steel Corporation was organized the officials of the various constituent companies decided upon the improvements and enlargements to be made to their plants; but on the formation of the corporation another method of deciding these matters went into effect. The officers of the various companies, after deciding that certain improvements or enlargements are necessary, send their suggestions to the offices of the corporation in this city, where all the suggestions are acted upon by the advisory board. While many suggestions are received they are not always acted upon favorably, as it now lies within the power of this board to make improvements and enlargements where they will be most advantageous. It has been practically decided that the bulk of the improvements will hereafter be made in Pittsburg, Wheeling, Youngstown, the Cleveland district and Chicago. The corporation's greatest properties are in these territories and in furtherance of the plan of centralization already mapped out these districts will be constantly developed.

One of the plans suggested to the advisory board to increase the steel output is so to equip all the open-hearth furnaces of the Carnegie Steel Co. at Duquesne, that the steel may be made by the Monell process which has already proved so successful at Homestead. The furnaces operated by this process show a greater output than the other furnaces in these plants and it is estimated that the monthly output can be increased by thousands of tons by adopting this process at all the open-hearth plants of the company.

Ever since the organization of the American Sheet Steel Co., the output of its heavier gauges has been much smaller in proportion to the demand than that of the lighter gauges. Additional mills for the rolling of heavier gauges will shortly be instaled at a number of the plants of the company.

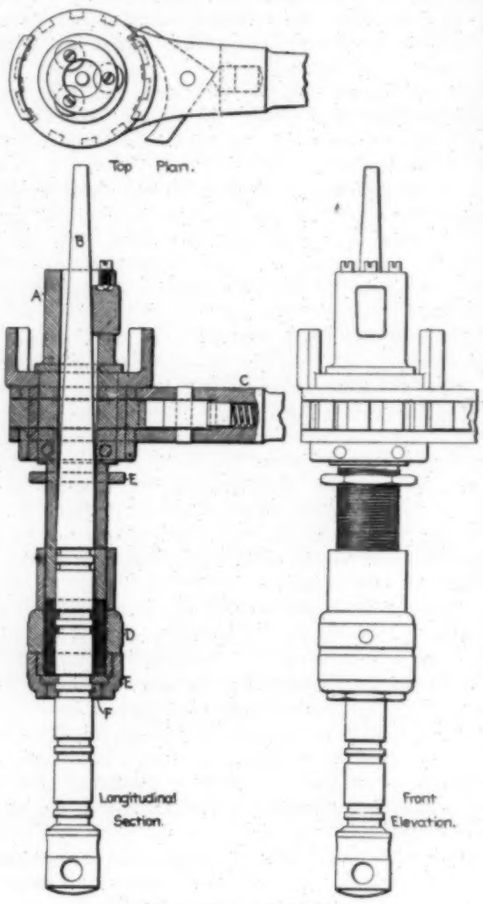
At Youngstown, O., the district management has suggested the erection of a fourth 600-ton blast furnace and in all probability the stel producing capacity of the Ohio plant of the National Steel Co. will be materially increased.

The American Tin Plate Co. will also in the near future install machinery for the rolling of black plate for tin mills that will be largely automatic. The method of rolling black plate in this country has not advanced much over the methods in vogue 25 years ago and the influence of the Amalgamated Association has largely prevented the introduction of automatic rolling devices up to the present time. We have been officially advised that the method to be adopted will be different from any of those patented in recent years, and has been developed by some of the officials of the company. While a number of recently patented methods have been tried none of them is being seriously considered for adoption. It is stated on reliable authority that machinery in this process will do from two-thirds to three-fourths of the work now done by hand on the hot mills and the output will be materially increased. It is probable that one plant will be built for the purpose of equipping it with this new tin plate machinery and as the process has been tried and has proved successful there is no further doubt as to its feasibility.

Whether the Amalgamated Association will stand in the way of the American Tin Plate Co. in the further introduction of this machinery into the mills now under its control is a matter for future consideration. It is certain, however, that unless the association adjusts its scale to meet the new condition of affairs other steps will have to be taken to enable the company to make tin plate cheaper than it is made today. With the new method it is estimated that the American Tin Plate Co. will not only be able to compete with foreign manufacturers at home without the aid of the tariff, but will also be enabled to compete with the foreign manufacturers in all enabled to compete with the foreign manufacturers in mean a greater demand for the products of the American Tin Plate Co. and would make the United States the greatest tin plate manufacturing company in the world.

A NEW TUBE EXPANDER.

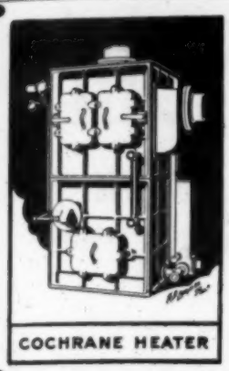
A tube expander is illustrated by the *Engineering News*, showing several novel features. Three rollers are held loosely by set screws in the casing A. Instead of revolving the taper pin B and feeding it by continued hammering upon the head, the entire roller case is revolved by means of the ratchet lever C. Applying the power to the case instead of to the pin is said to increase the speed of the work, and also to facilitate rolling impertect interior tube surfaces, such as lumpy welds, etc. The taper pin is fed by means of the screw feed nut D, thus avoiding all hammering upon the pin. At



NEW TUBE EXPANDER.

the bottom of the feed nut, a thin hexagon nut E is shown, which acts as a depth gauge. By removing the upper cap E of the feed nut the split interlocking ring F may be shifted from one double slot to another upon the taper pin, thus making it possible to roll tubes varying in diameter from 2¾ to 3¼ inches. The rollers are made with the proper taper to bring their surfaces parallel with the interior surface of the tube. This tube expander is manufactured by the Watson-Stillman Co., of 204-210 East 43d street, New York.

The Fox plant of the Pressed Steel Car Co., at Joliet, Ill., will resume operations shortly after the first of the year. Sufficient orders have been booked to keep the plant in full operation throughout the next year.



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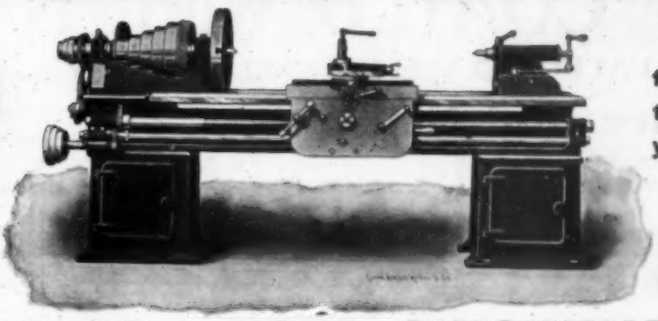

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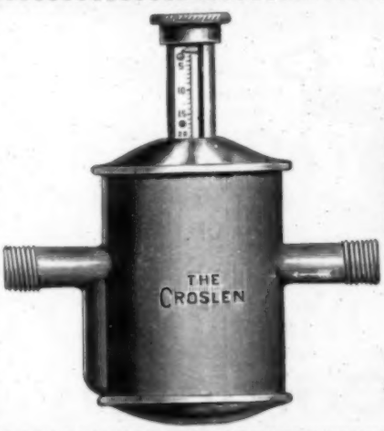

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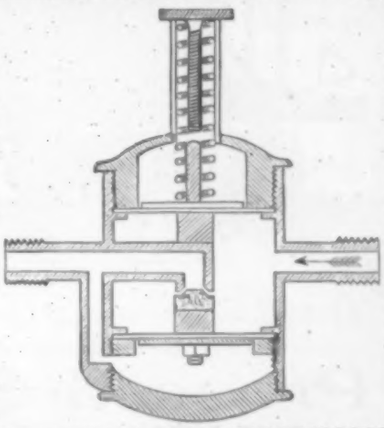

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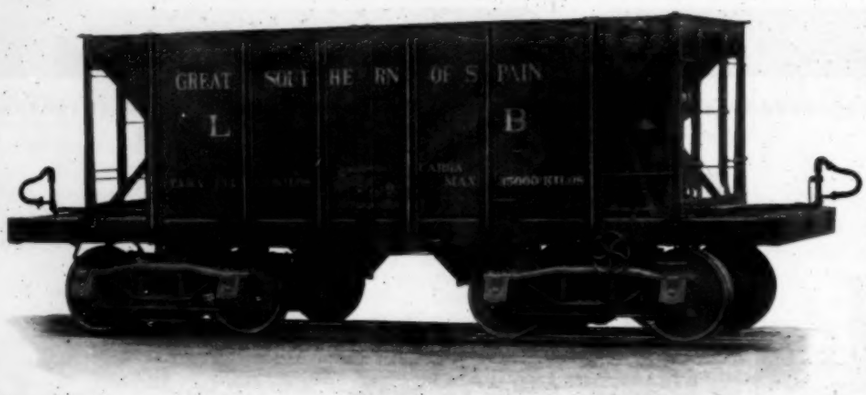

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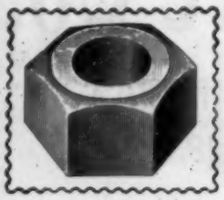

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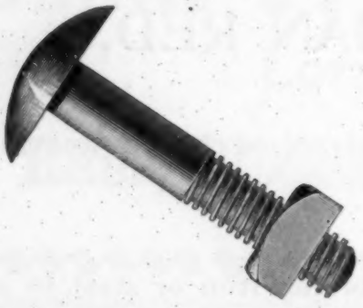

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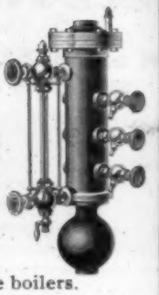

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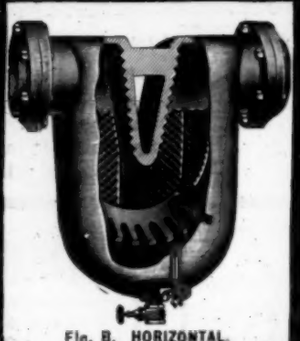
Fig. B. HORIZONTAL.

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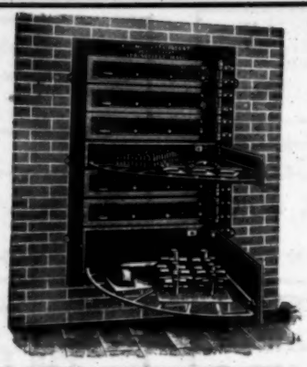

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